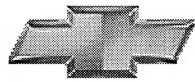


Chevrolet



Astro Van



2000

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Product Information

2000 Chevy Astro Boasts Safety and Performance Enhancements

DETROIT — Safety and performance improvements to the 2000 Chevy Astro will help make it even more popular with buyers in the minivan market. From its new battery-rundown protection feature to a more durable V6 engine, Astro is more refined than ever.

"In addition to performance refinements this year, we've taken a close look at what we could enhance with regards to Astro's already impressive list of safety and security features," says Astro Brand Manager Dan Keller. "Consequently, we've added several new safety and security items."

Safety and Security Improvements Include:

- Optional Remote Keyless Entry system with panic alarm for added security.
- Lockout provision which prevents the driver door from locking if the key is inadvertently left in the ignition (requires power door locks).
- Battery-rundown protection system that automatically turns off interior lamps 20 minutes after the ignition is turned off.
- Automatic Exterior Lamp Control, which automatically activates the exterior lights under low-light driving conditions, is now included with the standard Daytime Running Lamps.
- Key carryover safety and security features include standard driver and front-passenger air bags,* power front disc/rear drum brakes, child security sliding-door lock and a PASSlock® theft-deterrent system that deactivates the Astro fuel system when unauthorized attempts are made to start the vehicle.

Performance Improvements

Performance enhancements include a new plastic fuel tank with increased capacity for longer intervals between fuel stops. The powerful Vortec V6 engine now offers quieter operation and extended durability than the previous version. A new standard tow/haul switch improves transmission shifts when trailering or hauling, and an improved antilock brake system (ABS) controller provides increased reliability.

Comfort and Convenience Enhancements

New reminder and warning chimes alert the driver when the key is left in the ignition, the headlamps are on, the safety belt is unfastened or the turn signal remains activated. A new flash-to-pass feature alerts the driver of a vehicle in front of an attempt to pass. The new retained accessory power system allows the stereo, power windows and overhead console to be used for up to 20 minutes after the ignition has been turned off. This new feature makes it convenient for buyers to close a window or power sunroof inadvertently left open without having to re-start the engine.

Key carry-over features include comfortable eight-passenger seating, front air conditioning, interior delayed- entry lights and a choice of cloth or leather seating surfaces, depending on model.

Value and Versatility

The popular Astro LS-Astro Max offers buyers added value with its long list of standard features such as: chrome-cladded steel wheels, power door locks and windows, cruise control, overhead roof console, power mirrors, tilt steering wheel, Remote Keyless Entry and more.

For extra peace of mind during hazardous road conditions, an All-Wheel-Drive Astro is available.

Also available is the Astro Cargo Van — a tough, dependable van with enough room for large hauling needs. In fact, no other compact cargo van can carry more than Astro.

2000 Chevrolet Astro Van Restoration Kit

From family transportation to heavy cargo hauling, any way you look at it, Astro is a hard-working, versatile van. Chevy Astro — minivan versatility with the strength and competence of a truck.

- * Always use safety belts and proper child restraints, even with air bags. Children are generally safer when properly secured in a rear seat. See the owner's manual for more safety information.

Model Summary

- Passenger Van, rear-wheel drive
- Passenger Van, All-Wheel-Drive
- Cargo Van, rear-wheel drive
- Cargo Van, All-Wheel-Drive.

Trim levels*

- Base
 - LS Astro Max
 - LT
- Astro Cargo Van is available in Base trim only.

Brand Identity

What's New And Highlights

Running Boards

Sturdy, integrated running boards available on Passenger Van models provide easy entry and exit.

Astro LS - Astro Max Package

The Astro LS - Astro Max Package provides numerous standard feature at a substantial value — including an AM/FM stereo with cassette player.

Interior

- Reminder and warning chimes for: key in ignition, headlamps on, safety belt unfastened, turn signal on.
- Retained Accessory Power.

Exterior

- Argent-painted steel wheels on Base model
- Automatic Exterior Lamp Control
- Flash-to-pass feature.

Engineering

- Tow/Haul trailering switch.

Engines

- Vortec 4300 V6 SFI engine enhancements
- Plastic fuel tank with 27-gallon capacity (approx.)
- Exhaust system enhancements.

Brakes

- Increased ABS reliability

Seating Packages

An available seven-passenger seating package along with multiple storage bins and cup holders provide added convenience

All-Wheel Drive

The Astro All-Wheel-Drive system provides its owners with added confidence when driving over difficult road conditions

Safety and Security

- Remote Keyless Entry with panic alarm
- Lock-out protection included with power door locks
- Battery-rundown protection.

Marketplace: Astro Passenger Van

Versatility and capability are key ingredients of Chevy Astro. In fact, no minivan can match Astro for cargo capacity, trailering capability and comfortable eight-passenger seating.* This versatile midsize van provides families with generous interior room and the peace of mind that its available All-Wheel-Drive system brings.

The LS Astro Max Package provides a laundry list of standard features, such as power door locks and windows, overhead roof console, chrome-cladded steel wheels and more — all at a tremendous value.

Vehicle Overview

Interior Overview

Key Standard Features*

Astro Passenger Van Base And Cargo Van Model:

- Reminder and warning chimes for: key in ignition, headlamps on, safety belt unfastened and turn signal on
- Retained Accessory Power feature maintains power to stereo and other interior electronics for 20 minutes after the ignition is turned off, or until any door is opened
- 8-passenger seating in Custom Cloth (Passenger Van)
- Two front reclining vinyl bucket seats (Cargo Van)
- Driver and front-passenger air bags†
- PASSlock® theft-deterrent system
- Delayed-entry interior lights
- ETR AM/FM stereo with seek-scan and digital clock
- Front air conditioning
- Cup holders
- Auxiliary power outlets
- Engine cover convenience console includes such handy features as dual auxiliary power outlets, dual cup holders, a glove box and a map net
- Intermittent variable windshield wipers
- Passenger assist handles
- Door map pockets
- Ribbed load floor makes sliding heavy cargo easy (Cargo Van).

Astro LS and Astro Max Passenger Van Adds The Following, In Addition To Or Replacing Base Model Features:

- Sunshades with illuminated vanity mirrors
- Tilt-Wheel™ steering column and cruise control
- Cargo convenience net
- Solar-Ray deep-tinted glass
- Overhead console with trip computer
- Remote Keyless Entry
- Power door locks and windows
- ETR AM/FM stereo with cassette, seek-scan and digital clock
- Front seat storage
- Rubber floor mats.

Astro LT Passenger Van Adds The Following, In Addition To Or Replacing Ls Max Model Features:

- Front and rear air conditioning
- Rear heating

2000 Chevrolet Astro Van Restoration Kit

- ETR AM/FM stereo with cassette player, remote compact disc, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- 8-passenger seating trimmed in Special Cloth
- 6-way power driver seat
- Leather-wrapped steering wheel.

Key Optional Features*

- Available roof console with trip computer (standard with LS and LT trim) includes average and instantaneous fuel economy, trip range, fuel consumption and elapsed time
- Front and rear air conditioning (Passenger Van only)
- Convenience Group with Tilt-Wheel™ steering column, cruise control and power door locks and windows
- Rear compartment convenience net.

* See Feature Availability Chart on page 9 for additional features.

† Always use safety belts and proper child restraints, even with air bags. Children are safer when properly secured in a rear seat. See the owner's manual for more safety information.

Exterior/Structural Overview

Key Standard Features*

Astro Passenger Van Base Model And Cargo Van Model:

- **NEW** Automatic headlamp feature activates automatically during low light conditions
- **NEW** Flash-to-pass feature turns on high beams when attempting to pass. The feature is activated by the driver pulling the turn signal lever rearward
- **NEW** 15" argent-painted steel wheels
- Daytime Running Lamps (DRL)
- Black, foldaway mirrors
- P215/75R15 all-season blackwall tires
- Wide-opening rear and side doors
- Two-sided galvanized steel is used for all major exterior body panels (except the roof, where it is not needed) to help prevent surface rust due to minor chips and scratches
- Seven-stage zinc phosphate wash and zinc-rich corrosion-resistant primer
- Sealers are applied to body seams for added corrosion protection before final assembly
- Aluminized stainless-steel muffler and tailpipe
- Unibody (integral frame) structure that incorporates a partial front ladder-type stub frame with the floor panels adds rigidity without excessive weight. This design helps maximize strength and payload capacity
- Single-piece stampings, which comprise the underbody, right- and left-side panels, roof panel and front end helps provide increased structural rigidity
- Single-piece front-door frames, window frames, side- and rear-door openings help protect against corrosion by eliminating vulnerable seams
- Plastic resin in some parts — such as the radiator coolant reservoir, windshield washer reservoir and fuel tank shield — are labeled to facilitate recycling.

Astro LS Astro Max Passenger Van Adds The Following, In Addition To Or Replacing Base Model Features:

- Body-side cladding
- Power mirrors
- Chrome-cladded wheels
- Luggage carrier.

Astro LT Passenger Van Adds The Following, In Addition To Or Replacing Ls Max Model Features:

- Rear Dutch doors with liftglass and window defogger
- Brushed aluminum wheels.

Key Optional Features*

- Running boards feature a sturdy, integrated design that helps make Astro Passenger Vans more attractive while providing passengers with easy entering and exiting (dealer-installed option)
- Smooth front fascia and rear bumper, which are painted the body color on Astro Cargo Van models with YF7 and are standard trim on Astro Passenger Van models
- Body-side cladding which provides dramatic styling (standard on LS and LT; optional on Cargo Van models with YF7 Upfitter Package)
- Luggage carrier
- P215/75R-15 all-season white-lettered tires.

Exterior Paint

Standard basecoat/clearcoat paint on Astro helps resist fading and provides a high gloss shine for long-lasting exterior beauty.

Paint Colors

- Medium Charcoal Gray Metallic
- Medium Bronzemist Metallic
- Ivory White
- Teal Blue Metallic
- Dark Copper Metallic
- Silvermist Metallic
- Light Carmine Red Metallic
- Medium Cadet Blue Metallic
- Dark Forest Green Metallic
- Light Autumnwood Metallic.

Stripe Colors:

- Silvermist
- Bronzemist
- Light Autumnwood.

* See Feature Availability Chart for additional features.

Functional Overview

Key Standard Features*

Astro Passenger Van And Cargo Van Model:

- Plastic fuel tank (approx. 27-gallons) is larger than its predecessor for fewer fuel stops
- Tow/Haul switch helps provide improved shifting when trailering or hauling
- Vortec 4300 V6 SFI engine
- Electronically controlled 4-speed automatic overdrive transmission (4L60-E)
- 4-wheel antilock brake system (ABS)
- Power front disc/rear drum brakes
- 100,000-mile platinum-tip spark plugs†
- 150,000-mile extended-life engine coolant.†

* See Feature Availability Chart on page 10 for additional features.

† Maintenance needs vary with different uses and driving conditions. See owner's manual for details.

Safety And Security*

Crash Avoidance Features

- **NEW** Automatic Exterior Lamp Control (included with Daytime Running Lamps) turns-on automatically during low light conditions
- **NEW** Antilock brake system is designed for increased reliability†
- 4-wheel antilock brake system
- Brake/transmission shift interlock, a feature of the automatic transmission, requires drivers to depress the brake pedal to shift out of Park
- Sloping hood design and large windshield help contribute to road visibility.

Occupant Protection Features

- Driver and front-passenger air bags**
- Three-point energy-absorbing safety belt system at outboard seating positions
- Rear-seat (outboard seats) shoulder belt comfort guides on passenger vans
- Child security sliding-door lock
- Reinforced safety cage
- Front and rear crush zones
- Energy-absorbing steering column and instrument panel.

Security Features

- **NEW** Lockout provision prevents the driver's door from locking if the key is inadvertently left in the ignition (requires power door locks)
- **NEW** Battery-rundown protection feature automatically turns off interior lamps 20 minutes after ignition is turned off
- **NEW** Remote Keyless Entry with panic alarm adds convenience and security (optional)
- PASSlock® theft-deterrent system is totally passive. If an attempt is made to start the vehicle without the proper key, the fuel system is disabled
- HomeLink 3-channel transmitter, optional on Base, LS Astro Max and LT models with available roof console, memorizes the activation codes for up to three remote control devices (such as garage door, gate and security lights) to help promote personal security.

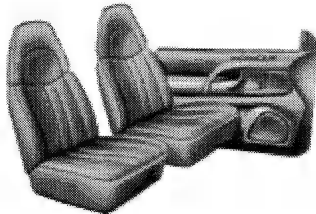
* For additional safety information, see the Chevrolet section of this Guide.

† Maintenance needs vary with different driving uses and driving conditions. See owner's manual for details.

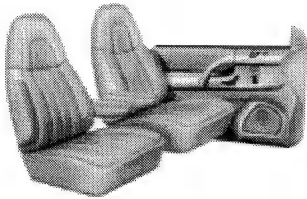
** Always use safety belts and proper child restraints, even with air bags. Children are safer when properly secured in a rear seat. See the owner's manual for more safety information.

Seats

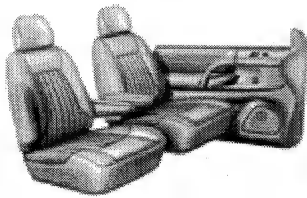
Lap and shoulder safety belts and head restraints help protect front passengers. Occupants in the intermediate and rear bench seats have lap safety belts, shoulder safety belts and head restraints on outboard seating positions.



Front high-back reclining Custom Vinyl bucket seats — standard on Astro Cargo Van



Front high-back reclining Custom Cloth adjustable bucket seats with folding integral armrests and adjustable 3-passenger center- and rear-row bench seats — standard on Base and LS. Available on Cargo Van (front seats only).



Front reclining Special Cloth or high-back bucket seats with Special Leather seating surfaces, folding integral armrests and adjustable head restraints. Split-back center- and rear-row seats with fold-down center console, convenience tray and cup holders — standard on LT in Special Cloth, optional on LT with Special Leather seating surfaces.

Alternate Seating Packages (Passenger Van):

- ZP7 7-passenger seating includes: 4 high-back reclining bucket seats and a 3-passenger adjustable rear-row seat
- Standard ZP8 8-passenger seating includes: two high-back front reclining bucket seats and two 3-passenger adjustable rear-bench seats.*

Interior Colors

Cloth and Leather:

- Medium Gray
- Blue†
- Neutral.

* Two split-back rear bench seats with LT trim.

† Not available in special cloth or special leather (LT models).

Sound Systems

Standard

Base And Cargo Van Model:

- ETR AM/FM stereo with seek-scan and digital clock.

LS Astro Max Model:

- ETR AM/FM stereo with cassette player, seek-scan and digital clock.

LT Model:

- ETR AM/FM stereo with compact disc and cassette players, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control.

Optional

All Models:

- ETR AM/FM stereo with cassette player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- ETR AM/FM stereo with compact disc player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- ETR AM/FM stereo with remote compact disc and cassette players, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- Center-row radio controls are available with the uplevel cassette player and dual playback cassette/compact disc player systems (not available on Base or Cargo Van models).

Suspension

Front

- Torsion bars on All-Wheel-Drive models use micro-alloyed spring steel that eliminates torsion bar adapter tubes — helping to reduce mass and contributing to overall fuel economy
- Upper and lower control arms are included with the All-Wheel-Drive model's independent suspension. A stabilizer bar and torsion bars which are computer-selected, help optimize ride and handling
- Independent front suspension on rear-wheel-drive models feature upper and lower control arms, a stabilizer bar and computer-selected, friction-free coil springs.

Rear

- Rear axle shafts are hardened for fatigue-resistance and durability
- Variable-rate, steel multi-leaf rear springs help provide a smooth ride and minimize jounce.

Axles

Two axle ratios are available with All-Wheel-Drive models:

- 3.42:1 for mid-range towing needs
- 3.73:1 for maximum torque and towing capability.

Rear-wheel-drive models offer three axle ratios:

- 3.23:1 for maximum fuel economy
- 3.42:1 for mid-range towing needs

- 3.73:1 for maximum torque and towing capability.

Steering

Recirculating ball-type power steering system is standard on all Astro models. It provides a steering gear ratio change of 16/13:1. This system contributes to retained steering effort, good road feedback and reduced steering gear noise.

Brakes

Antilock brake system is designed for increased reliability.* This means fewer service appointments and added driver peace of mind

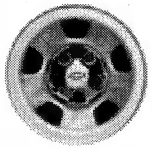
- Power front disc/rear drum brakes are standard on Astro
 - Large (11.5" diameter AWD; 11.8" RWD) ventilated front rotors help provide excellent brake cooling
 - Audible pad-wear sensors alert the driver when brake pad maintenance is needed
 - GM's ABS VI antilock brake system is standard equipment. This system helps the driver maintain steering control during severe braking situations by reducing wheel lockup on most slippery surfaces. The driver simply maintains pressure on the brake pedal and steers the vehicle.
- * Maintenance needs vary with different uses and driving conditions. See owner's manual for more information

Wheels and Tires

Wheels



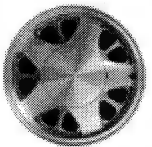
15" x 6" argent-painted steel wheel standard on Base models



15" x 6.5" styled-steel, painted optional on Base models.



15" x 6.5" chrome-cladded styled-steel standard on Astro LS Astro Max with 1SC, optional on other models.



15" x 6.5" brushed-aluminum standard on LT, optional on LS and Base Cargo Vans with YF7 Upfitter Package

Tires

- P215/75R-15 blackwall all-season steel-belted radials are standard on Astro

2000 Chevrolet Astro Van Restoration Kit

- P215/75R-15 white outline-lettered all-season steel-belted radials are optional.

Astro Powertrains

Engineering

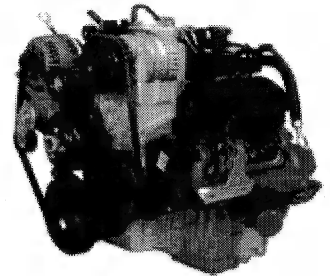
At its manufacturing plant in Baltimore, Maryland, numerous manufacturing processes help maintain quality and product consistency on every vehicle.

Engines

Vortec 4300 V6 SFI Engine (L35)

The Vortec 4300 V6 engine with Sequential Fuel Injection (SFI) is standard on Astro. This refined V6 engine is the largest displacement V6 in the midsize van class.*

- The Vortec V6 engine features new roller rocker arms, a new roller timing chain and powdered metal sprocket. These new components help provide quieter operation and extended durability.



Vortec 4300 V6 Power Ratings:

- 190 horsepower at 4400 rpm
- 250 lb.-ft. of torque at 2800 rpm.

Vortec 4300 V6 Technical Features:

- Sequential Fuel Injection (SFI)
- High precision fuel control
- Each injector is fired sequentially and timed to the intake cycle for accuracy and metering control. This helps provide precise timing and smooth overall performance
- Mass airflow meter constantly measures the engine's air requirements under varying conditions, such as changes in load, altitude and temperature. In a SFI system, the mass airflow meter is essential for accurate fuel delivery
- Injector nozzle's design and optimum location produce an effective spray pattern that helps contribute to the engine's smooth idle and optimum fuel efficiency
- Low maintenance due to platinum-tip spark plugs which are designed to go up to 100,000 miles before the first scheduled replacement and extended-life engine coolant that is designed to last up to five years or 150,000 miles whichever comes first†
- Single accessory drive belt.

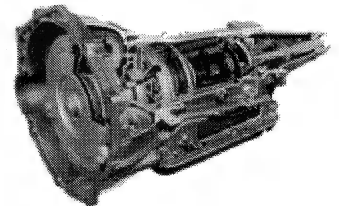
* Mid-size van class based on GM segmentation. Excludes other GM vehicles.

† Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

Transmissions

4L60-E 4-Speed Electronic Automatic Transmission

The GM 4L60-E 4-speed automatic overdrive transmission is standard on Astro. The 4L60-E's "intelligent" electronic controls allow the transmission to match the engine's performance, helping to deliver optimum fuel efficiency.



4L60-E Technical Features:

- Vamac pump cover seals help provide good sealing properties
- Clutch plate material helps durability and performance
- Wide range of gear ratios
- Powertrain Control Module helps provide precision and flexibility. It measures key vehicle input, including throttle position, vehicle speed, gear range, temperature and engine load

- Contributing to a virtually seamless operation, the PCM acts as an interface between the engine and transmission
- Electronically-controlled shift-timing
- Brake/transmission shift interlock is standard. It requires the driver to apply the brake pedal to shift out of PARK
- Second-gear-start feature helps reduce torque to the drive wheels by moving the gear selector to the DRIVE 2 position, thereby increasing control during initial acceleration on slippery surfaces
- Automatic transmission fluid in the 4L60-E has a fluid change interval of 50,000 miles* under normal operating conditions.

* Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

All-wheel-drive system

- All-Wheel-Drive system operates in RWD until it senses rear wheel slip, at which time it transfers torque to the front axle to help regain traction
- Transfer case assembly, control module and electrical harness are the system's components.

Engine and Transmission Usage

Model	Engine	Transmission
M110 (05)	4.3L V6 (L35)	4 Spd. Auto. (M30)
M110 (06)	4.3L V6 (L35)	4 Spd. Auto. (M30)
L110 (05)	4.3L V6 (L35)	4 Spd. Auto. (M30)
L110 (06)	4.3L V6 (L35)	4 Spd. Auto. (M30)

Model Codes:
M--Rear Wheel Drive
L--Automatic Four Wheel Drive
05--Cargo Van
06--Passenger Van

Feature Availability

	Base	LS	LT	Cargo Van
Interior				
Air bags TM driver and right front-passenger	S	S	S	S
Air conditioning TM front, with CFC-free refrigerant	S	S	S	S
Air conditioning TM front and rear	O	O	S	NA
Battery rundown protection	S	S	S	S
Console overhead with trip computer	O	S	S	O
Convenience Group– Tilt-Wheel TM & cruise control, power door locks & power windows	O	S	S	O
Cup holders	S	S	S	S
Door trim – driver and passenger, color-keyed cloth/carpet	S	S	S	NA
Flash-to-pass	S	S	S	S
Floor mats – rubber	O	S	S	NA
Gauges –fuel level, odometer, oil pressure, speedometer, temperature gauge, trip odometer, voltmeter	S	S	S	S
Heating – rear	O	O	S	NA
Lights, interior – delayed entry	S	S	S	S
Locks – power door	O	S	S	O
Lockout protection	S	S	S	S
PASSlock [®] theft-deterrent system	S	S	S	S
Retained accessory power	S	S	S	S
Seating – 8-passenger	S	S	S	NA
– 7-passenger	O	O	O	NA
– 2-passenger	NA	NA	NA	S
Seats– cloth front reclining buckets & two three-passenger bench seats	S	S	NA	NA
– special cloth front reclining buckets & two split-bench seats	NA	NA	S	NA
– special leather front reclining buckets & two split-bench seats	NA	NA	O	NA
– vinyl front reclining buckets	NA	NA	NA	S
– cloth front reclining buckets	NA	NA	NA	O
Steering wheel – black four-spoke	S	S	NA	S
– black leather wrapped	NA	NA	S	NA
Stereo – ETR AM/FM w/seek-scan and digital clock	S	NA	NA	S
– ETR AM/FM w/cassette player, seek-scan and digital clock	O	S	O	O
– ETR AM/FM w/compact disc, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control	O	O	O	O
– ETR AM/FM w/ cassette player, remote compact disc, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control	O	O	S	O
– rear-seat radio controls and jacks	NA	O	O	NA
Storage compartment – left rear quarter, third-seat area	S	S	S	NA
Sunshades – cloth w/extendors	S	NA	NA	NA
– cloth w/lighted mirrors, extendors (dual blade with LT trim)	O	S	S	NA
– vinyl color-keyed	NA	NA	NA	S

Trailer Tow/Haul switch	S	S	S	S
Windows – swing-out on sliding door, LH quarter panel	S	S	S	O
Windows – swing-out on rear door	NA	S	S	O
Wipers – intermittent variable	S	S	S	S
Exterior				
Daytime Running Lamps (DRL) with Automatic Exterior Lamp Control	S	S	S	S
Doors – sliding RH side, RH and LH rear loading	S	S	S	S
Doors – rear dutch w/liftglass and rear window defogger	O ¹	O	S	O
Luggage carrier	O	S	S	NA
Mirrors – below eyeline foldaway, black	S	NA	NA	S
– below eyeline electric remote control, black	O	S	S	NA
Running boards (dealer-installed)	O	O	O	NA
Tires – P215/75R-15 all-season blackwall	S	S	S	S
– P215/75R-15 all-season white lettered	O	O	O	O
Wheels– steel 15" x 6" argent-painted	S	NA	NA	S
– styled-steel 15" x 6.5" silver painted	O	O	NA	O
– styled-steel 15" x 6.5" chrome-cladded	O	S	O	O
– brushed aluminum 15" x 6.5"	NA	O	S	NA
Functional				
Brakes – 4-wheel antilock (ABS) & power front disc/rear drum	S	S	S	S
Engine – Vortec 4300 V6 SFI	S	S	S	S
Fuel capacity – 27-gallon (approx)	S	S	S	S
Remote Keyless Entry with panic alarm	O ¹	S	S	O ¹
Trailer special equipment – up to 6000 lbs.	O	O	O	O
Transmission – 4-speed electronically controlled automatic	S	S	S	S

S — Standard.

O — Optional. [Some options may be available only as part of a Preferred Equipment Group(PEG)].

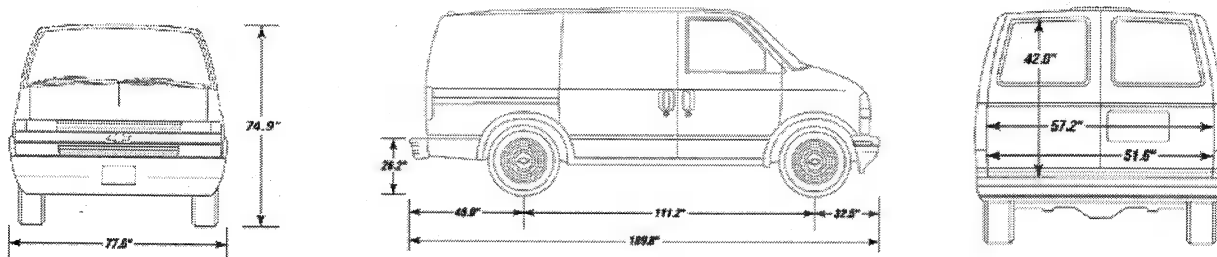
NA — Not available.

¹ Requires optional power door locks.

Specifications

Model Availability	
Astro Van RWD/AWD	
Passengers	7-8 (Passenger Van), 2 (Cargo Van)
Class	Midsize Van
Assembly plant	Baltimore, Maryland
Primary structure	Unibody, integral steel stub frame
Body material	Two-sided galvanized steel (except roof)

Dimensions



Exterior Dimensions				
	RWD		AWD	
	U. S. Standard	Metric	U. S. Standard	Metric
Wheelbase	111.2 in.	2825 mm	111.2 in.	2825 mm
Overall length	189.8 in.	4821 mm	189.8 in.	4821 mm
Overall height	74.9 in.	1903 mm	74.9 in.	1903 mm
Maximum width	77.5 in.	1987 mm	77.5 in.	1987 mm
Ground to rear load floor	25.9 in.	660 mm	25.9 in.	660 mm
Ground clearance front/rear	6.8/7.4 in.	173/188 mm	6.8/7.4 in.	173/188 mm
Interior Dimensions*				
	RWD		AWD	
	U. S. Standard	Metric	U. S. Standard	Metric
Headroom (front/mid./rear)	39.2/37.9/38.7 in.	996/963/983 mm	39.2/37.9/38.7 in.	996/963/983 mm
Legroom (front/mid./rear)	41.6/36.5/38.5 in.	1057/927/978 mm	41.6/36.5/38.5 in.	1057/927/978 mm
Shoulder room (front/mid./rear)	64.0/67.1/67.1 in.	1626/1704/1704 mm	64.0/67.1/67.1 in.	1626/1704/1704 mm
Hip room (front/mid./rear)	64.9/50.9/57.1 in.	1649/1293/1450 mm	64.9/50.9/57.1 in.	1649/1293/1450 mm

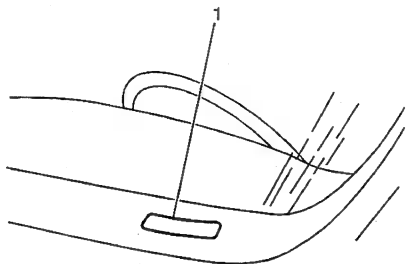
Specifications & Capacities

Capacities				
Curb weight (min.) (lbs./kg)	4186	1899	4433	2015
Maximum GVWR (lbs./kg)	5950	2699	6100	2767
Base payload (std.) (lbs/kg)	1764	801.1	1667	759
Cargo capacity (cu. ft./liters)	170.4	4838	170.4	4838.1
Max. trailer capacity (lbs./kg)	6000	2721	5800	2631
Fuel tank capacity (gal./liters)	27	101	27	101
* Front interior dimensions also apply for Astro Cargo Van models.				
Steering				
	RWD		AWD	
Type	Integral power		Integral power	
Steering ratio	16/13:1		16/13:1	
Turning diameter, curb-to-curb (ft./m)	40.5/13.7		43.8/14.8	
Brakes				
	RWD		AWD	
Type	Hydraulic power front disc/rear drum		4-wheel ABS	
Front size (disc) (in./mm)	11.86 x 1.04/301 x 26		11.57 x 1.25/294 x 32	
Rear size (drum) (in./mm)	9.5 x 2.0/241 x 51		9.5 x 2.0/241x 51	
Booster diaphragm	Hydro-boost		Hydro-boost	
Parking brake	Cable to rear wheels		Cable to rear wheels	
Engines				
	L35			
Type	Vortec 4300 V6 SFI			
Block material	Cast-iron			
Cylinder head material	Cast-iron			
Bore & stroke (in./mm)	4.00 x 3.48/101.6 x 88.4			
Displacement (cu. in./cc)	262/4300			
Compression ratio	9.2:1			
Induction system	SFI			
Valves/cylinder	2			
Lifters	Hydraulic roller			
Cam drive	Chain			
Horsepower/kW @ RPM (SAE net)	190 @ 4400/142 kW @ 4400			
Torque/N-m @ RPM (SAE net)	250 @ 2800/339 N-m @ 2800			
Redline (RPM)	5600			
Recommended fuel (min.)	87 Octane			
Transmissions				
	RWD & AWD			
Transmission type	4-speed electronically controlled automatic w/overdrive & torque converter			
1st	3.06			
2nd	1.63			
3rd	1.00			

4th	0.70			
Reverse	2.29			
Chassis				
	RWD	AWD		
Frame	Integral/unibody; partial front ladder-type frame incorp. w/floor panels	Integral/unibody; partial front ladder-type frame incorp. w/floor panels		
Front	Independent w/coil springs	Independent w/torsion bars		
Rear	Variable-rate steel multi-leaf springs	Variable-rate steel multi-leaf springs		
Shocks, front/rear (mm)	32/32	32/32		
Anti-roll bar, front (mm)	32*	30		
Rear axle	Semi-floating	Semi-floating		
* RWD Astro Cargo Van front anti-roll bar is 28mm.				
Mileage/Performance				
Powertrain	4-Speed automatic w/Vortec 4300 V6*		4-Speed automatic w/Vortec 4300 V6 AWD*	
Mileage:	mpg	liters/100km	mpg	liters/100km
City	16	14.7	15	15.7
Highway	20	11.8	19	12.4
Combined	18	13.1	17	13.8
Est. cruising range:	mi.	km	mi.	km
City	432	700	405	648
Highway	540	844	513	810
Combined	486	774	459	730
* Based on 1999 information.				
Trailer Information				
	RWD		AWD	
Trailer classification	Medium		Medium	
Gross trailer weight (lbs/kg., up to)	6000/2727		5800/2631	
NOTE: Trailer tongue weight should be 10 to 15 percent of total loaded trailer weight (up to 750 lbs.). Properly equipped. Maximum trailer weight is calculated by assuming only the driver is in the tow vehicle. Optional equipment, passengers or cargo will reduce the trailer weight rating.				
Wheels & Tires				
RWD & AWD				
Type*	Steel	Styled-steel	Chrome-cladded styled-steel	Brushed-aluminum
Size (in.)	15 x 6	15 x 6.5	15 x 6.5	15 x 6.5
* 15" x 6.5" argent-painted steel wheels standard with Base models; 15" x 6.5" chrome-cladded styled-steel wheels standard on Astro LS; 15" x 6.5" brushed-aluminum wheels standard on Astro LT. All uplevel wheels are optional on Base model.				
Tire type	All-season steel-belted radial blackwall			
Tire size	P215/75 R-15 blackwall			
Optional tire	P215/75 R-15 white outline-lettered			
All specifications are preliminary and subject to change. Chevrolet Motor Division, June 1999.				

Vehicle Identification

Vehicle Identification Number (VIN)



The vehicle identification number (VIN) plate is the legal identifier of the vehicle. The VIN plate is located on the upper LH corner of the Instrument Panel and can be seen through the windshield from the outside of the vehicle:

Position	Definition	Character	Description
1	Country of Origin	1	United States
2	Manufacturer	G	General Motors
3	Division	C,T	C - Chevrolet Truck T - GMC Truck
4	GVWR/Brake System	B C D E F G	B - 3001-4000/Hydraulic C - 4001-5000/Hydraulic D - 5001-6000/Hydraulic E - 6001-7000/Hydraulic F - 7001-8000/Hydraulic G - 8001-9000/Hydraulic
5	Truck Line/Chassis Type	M,L	M - Small Van - 4x2 L - Small Van - 4x4
6	Series	1,2	1 - ½ Ton 2 - ¾ Ton
7	Body Type	9	Extended Van
8	Engine Type	W	4.3L V6 CPI (L35)
9	Check Digit	--	--
10	Model Year	Y	2000
11	Plant Location	B	Baltimore, MD
12-17	Plant Sequence Number	--	--

VIN Derivative

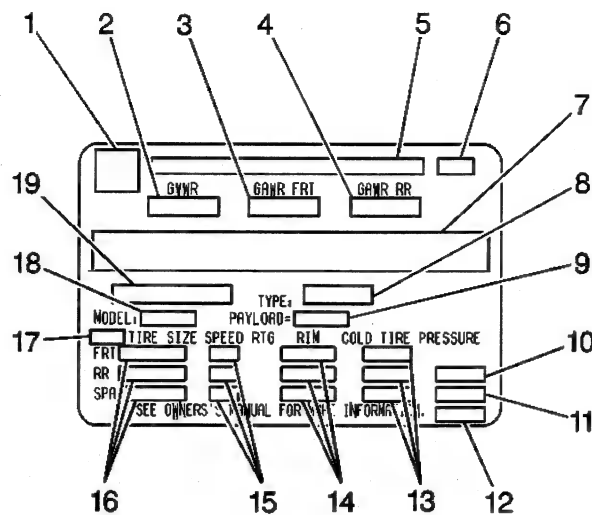
All engines and transmissions are stamped or laser etched with a partial vehicle identification number (VIN), which was derived from the complete VIN. A VIN derivative contains the following nine positions:

Position	Definition	Character	Description
1	GM Division Identifier	G	General Motors
2	Model Year	Y	2000
3	Assembly Plant	B	Baltimore, MD
4-9	Plant Sequence Number	--	--

A VIN derivative can be used to determine if a vehicle contains the original engine or transmission, by matching the VIN derivative positions to their accompanying positions in the complete VIN:

VIN Derivative Position	Equivalent VIN Position
1	2
2	10
3	11
4-5	12-17

Label Certification w/o RPO Z49



- (1) GM Logo
- (2) Gross Vehicle Weight Rating
- (3) Gross Axle Weight Rating - Front
- (4) Gross Axle Weight Rating - Rear
- (5) Name Of Manufacturer
- (6) Final Manufacturer's Date
- (7) Manufacturer's Statement
- (8) Model Designation
- (9) Payload
- (10) DUAL - When Equipped
- (11) Front Axle Reserve - When Equipped
- (12) Total Capacity - When Required
- (13) Tire Pressure
- (14) Rim Size
- (15) Speed Rating - When Required
- (16) Tire Size
- (17) GVW Rating Code
- (18) Engineering Model
- (19) Vehicle Identification Number

The vehicle certification label displays the following assessments:

- The Gross Vehicle Weight Rating (GVWR)
- The Gross Axle Weight Rating (GAWR) – Front and Rear
- The vehicle's payload rating
- The original equipment tire sizes and the recommended tire pressures

Gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. Include the following items when figuring the GVW:

- The base vehicle weight (factory weight)
- The weight of all vehicle accessories, like the winches or the plows
- The weight of the driver and the passengers
- The weight of the cargo

The gross vehicle weight must not exceed the Gross Vehicle Weight Rating.

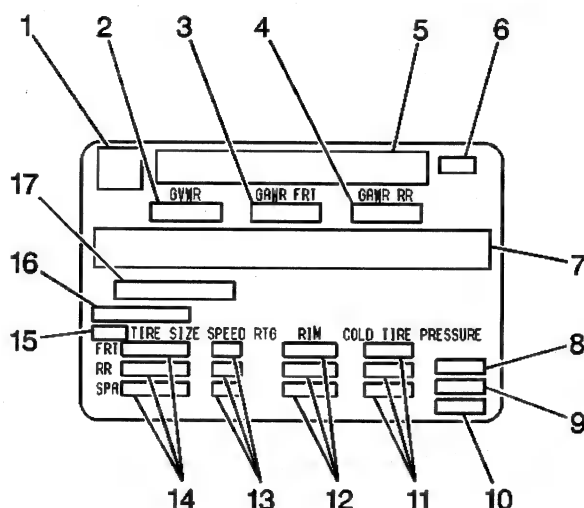
The front gross axle weight rating (GAWR FRT) is the weight exerted on the front axle. The rear gross axle weight rating (GAW RR) is the weight exerted on the rear axle. The front and rear gross axle weights must not exceed the front and rear gross axle weight ratings.

The payload rating defines the vehicle's maximum allowable cargo load. The cargo load includes the driver and the passengers. The payload rating is based on the vehicle's factory installed equipment. Deduct from the payload rating the weight of accessories added to the vehicle after the final date of manufacture .

The vehicle may have a Gross Combination Weight Rating (GCWR). The Gross Combination Weight Rating refers to the total maximum weight of the loaded tow vehicle (including driver and passengers) and a loaded trailer.

The vehicle's tires must be the proper size and properly inflated for the load the vehicle is carrying.

Label Certification w/o RPO Z49 – Incomplete Vehicle



- (1) Logo
- (2) Gross Vehicle Weight Rating
- (3) Gross Axle Weight Rating - Front
- (4) Gross Vehicle Weight Rating - Rear
- (5) Name of Manufacturer
- (6) Manufacturer's Date
- (7) Manufacturer's Statement
- (8) DUAL - When Equipped
- (9) Front Axle Reserve - When Required
- (10) Total Capacity - When Required
- (11) Tire Pressure - Spare Optional
- (12) Rim Size - Spare Optional
- (13) Speed Rating - When required - Spare Optional
- (14) Tire Size - Spare Optional
- (15) GVW Rating Code
- (16) Engineering Model
- (17) Vehicle Identification Number

The vehicle certification label displays the following assessments:

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- The vehicle's payload rating
- The original equipment tire sizes and the recommended tire pressures

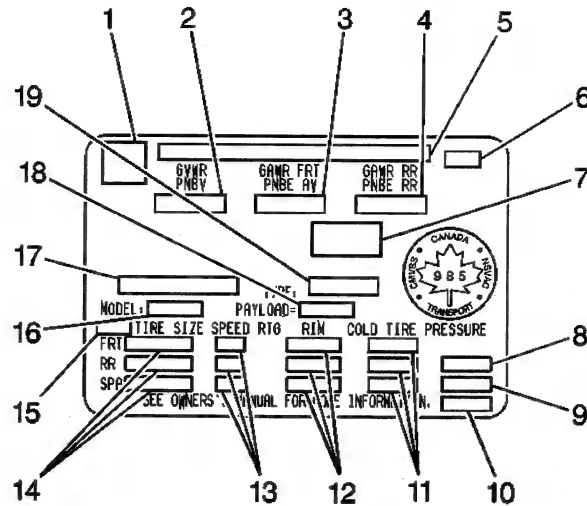
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- The base vehicle weight factory weight
- The weight of all vehicle accessories, like the winches or the plows
- The weight of the driver and the passengers
- The weight of the cargo

The gross vehicle weight must not exceed the Gross Vehicle Weight Rating.

The front gross axle weight rating (GAWR FRT) is the weight exerted on the front axle. The rear gross axle weight rating (GAW RR) is the weight exerted on the rear axle. The front and rear gross axle weights must not exceed the front and rear gross axle weight ratings.

Label Certification with RPO Z49



- (1) Logo
- (2) Gross Vehicle Weight Rating
- (3) Gross Axle Weight Rating - Front
- (4) Gross Axle Weight Rating - Rear
- (5) Name of Manufacturer
- (6) Final Manufacturer's Date
- (7) RFI Statement - Canada Only
- (8) DUAL - When Equipped
- (9) Front Axle Reserve - When Equipped
- (10) Total Capacity - When Required
- (11) Tire Pressure
- (12) Rim Size
- (13) Speed Rating - When Required
- (14) Tire Size
- (15) GVW Rating Code
- (16) Engineering Model
- (17) Vehicle Identification Number
- (18) Payload
- (19) Model Designation

The vehicle certification label displays the following assessments:

- The Gross Vehicle Weight Rating (GVWR)
- The Gross Axle Weight Rating (GAWR) -- Front and Rear
- The vehicle's payload rating
- The original equipment tire sizes and the recommended tire pressures

Gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. Include the following items when figuring the GVW:

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- The weight of the driver and the passengers
- The weight of the cargo

The gross vehicle weight must not exceed the Gross Vehicle Weight Rating.

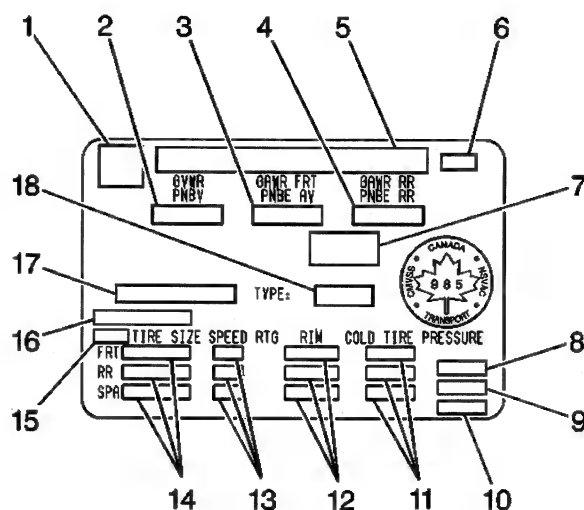
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The vehicle may have a Gross Combination Weight Rating (GCWR). The Gross Combination Weight Rating refers to the total maximum weight of the loaded tow vehicle including driver and passengers and a loaded trailer.

The vehicle tires must be the proper size and properly inflated for the load the vehicle is carrying.

Label Certification with RPO Z49 – Incomplete Vehicle



- (1) Logo
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- (11) Tire Pressure - Spare Optional
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- (14) Tire Size - Spare Optional
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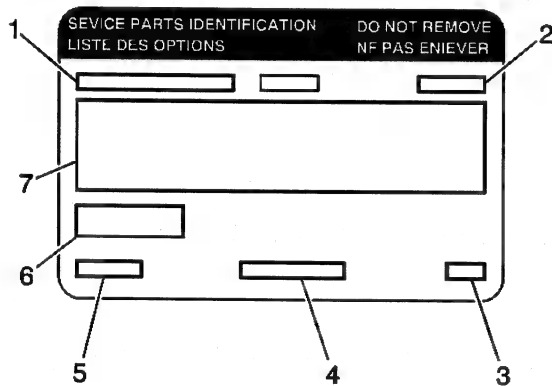
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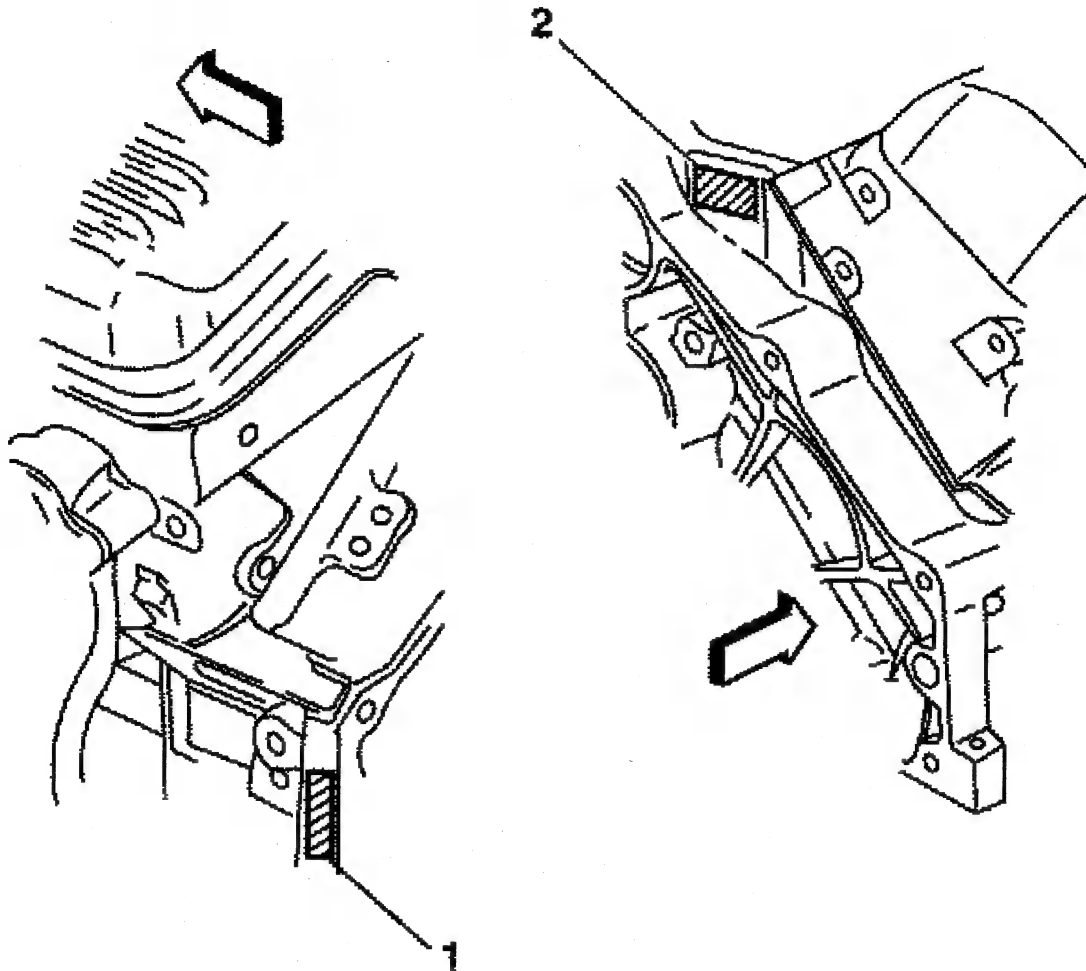
Service Parts Identification Label (SPID)



1. Vehicle Identification Number
2. Engineering Model Number (Vehicle Division, Vehicle Line and Body Style)
3. Interior Trim and Decor Level
4. Exterior (Paint Color) WA Number
5. Paint Technology
6. Special Order Paint Colors and Numbers
7. Vehicle Option Content

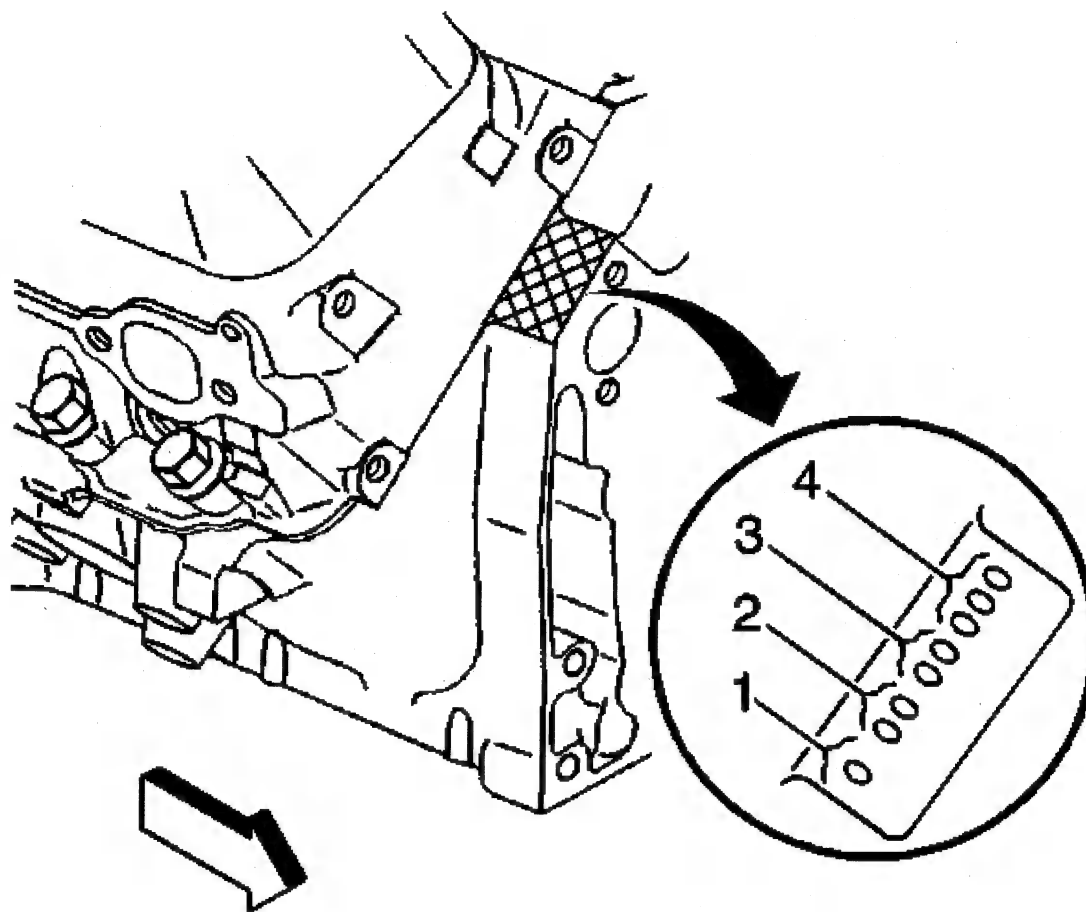
The service parts identification label is placed on the vehicle in order to help service and parts personnel identify the vehicle's original parts and the vehicle's original options.

Engine ID and VIN Derivative Location 4.3L



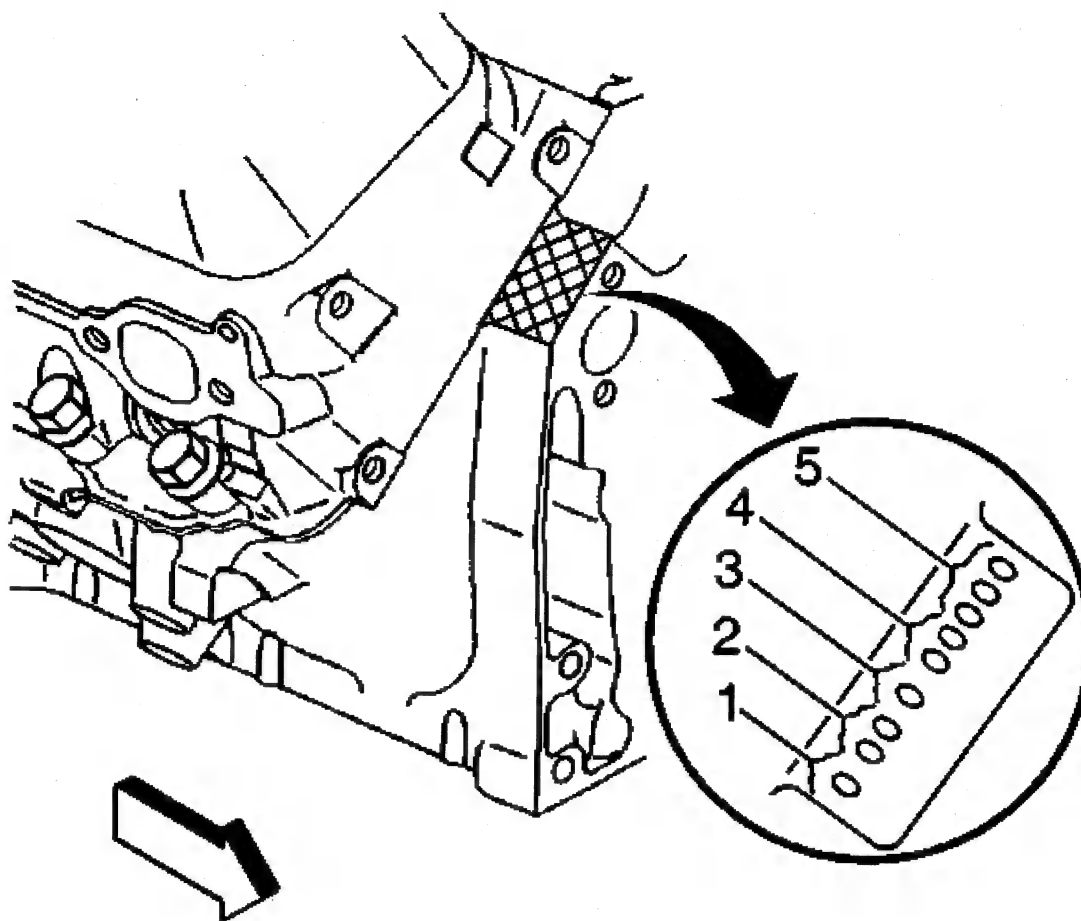
The Vehicle Identification Number (VIN) Derivative is located on the left side rear of the engine block (1) or on the right side rear (2) and typically is a nine digit number stamped or laser etched onto the engine at the vehicle assembly plant.

- The first digit identifies the division.
- The second digit identifies the model year.
- The third digit identifies the assembly plant.
- The fourth through ninth digits are the last six digits of the Vehicle Identification Number (VIN).



Engines built at the Tonawanda engine plant have the engine identification number located at the right front top of the engine block.

- The first digit (1) is the source code.
- The second and third digits (2) are the month of build.
- The fourth and fifth digits (3) are the date of build.
- The sixth, seventh, and eighth digits (4) are the broadcast code.

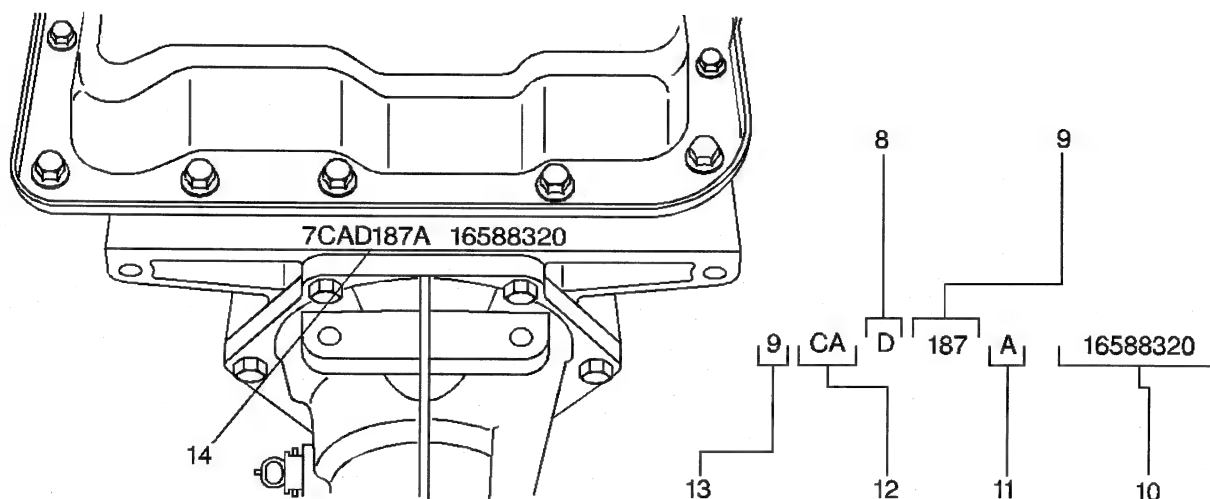
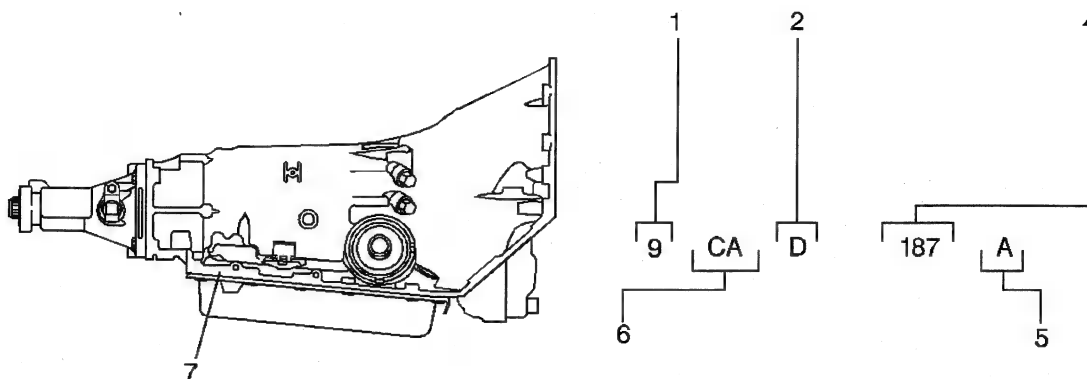


Engines built at the Romulus engine plant have the engine identification number located at the right front top of the engine block.

- The first digit (1) is the source code.
- The second and third digits (2) are the month of build.
- The fourth digit (3) is the hour of the build.
- The fifth and sixth digits (4) are the date of build.
- The seventh, eighth, and ninth digits (5) are the broadcast code.

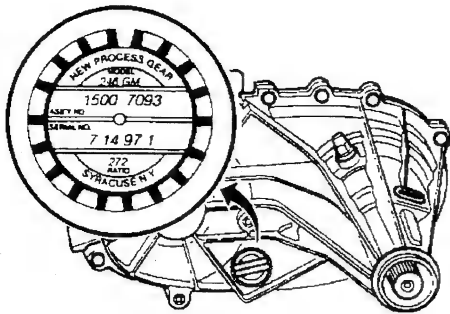
Transmission ID and VIN Derivative Location

4L60-E Transmission ID Location



- (1) Model Year
- (2) Hydra-Matic 4L60-E
- (4) Julian Date (or Day of the Year)
- (5) Shift Built (A, B, J = First Shift; C, H, W = Second Shift)
- (6) Model
- (7) Transmission ID Location
- (8) Hydra-Matic 4L60-E
- (9) Julian Date (or Day of the Year)
- (10) Serial No.
- (11) Shift Built (A, B, J = First Shift; C, H, W = Second Shift)
- (12) Model
- (13) Model Year
- (14) Transmission ID Location

Transfer Case Identification



NV MODEL IDENTIFICATION KEY

246

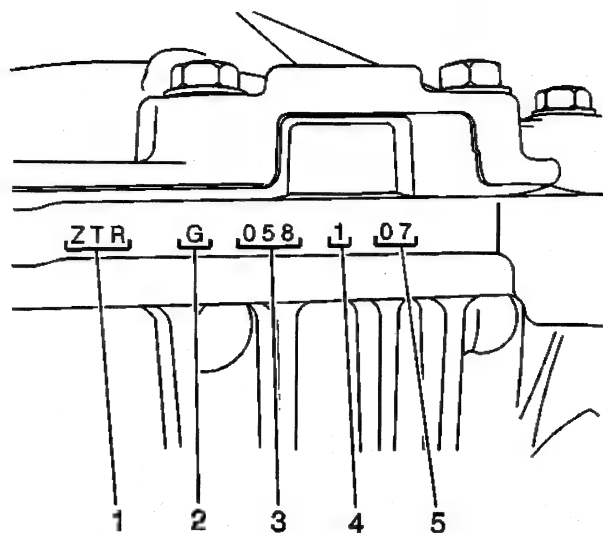
1	Single Speed	3	T – Truck/L – Van	1	Manual
2	2 Speed	4	K – Truck	3	Selectable
				6	Automatic

An identification tag is attached to the rear half of the transfer case. The tag provides the following information:

- The transfer case model number
- An assembly number
- A serial number
- The low range reduction ratio

The information on this tag is necessary for servicing the transfer case. If the tag is removed or becomes dislodged during service operations, keep the identification tag with the unit.

Axle Identification – Front



- (1) Broadcast Code
- (2) Supplier Code (G = American Axle)
- (3) Julian Date (Day of Year)
- (4) Shift Built (1 = First Shift; 2 = Second Shift) (Optional for 8.25" and 9.25" axles)
- (5) Hour Built

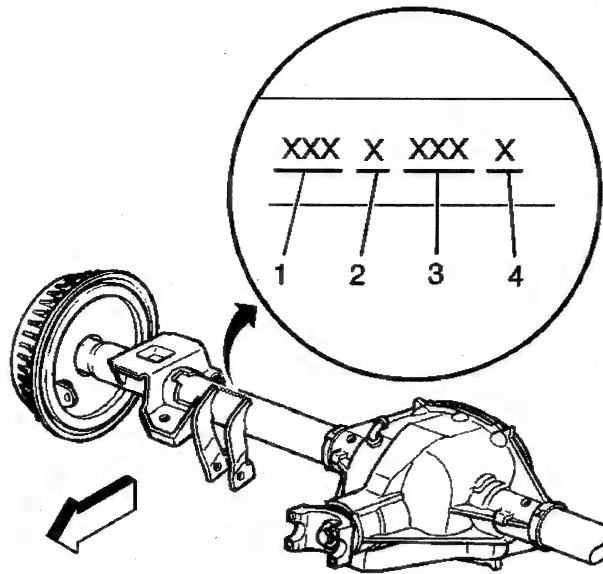
Front axle identification information is stamped on the top of the differential carrier assembly.

The following broadcast codes identifies the axle ratio:

Broadcast Code	Ratio
ZTM	3.08
ZTN, ZTU, ZTW, ZSY, ZA2, ZC2	3.42
ZTP, ZTR, ZTS, ZTX, ZSZ, ZB2, ZD2	3.73
ZTT, ZF2	4.10
ZH2	4.56

The information on the differential carrier assembly is necessary for servicing.

Axle Identification – Rear



- (1) Rear Axle Ratio
- (2) Build Source (C = Buffalo; K = Canada)
- (3) Julian Date
- (4) Shift Built (1 = First; 2 = Second)

All rear axles are identified by a broadcast code on the right axle tube near the carrier. The rear axle identification and manufacturer's codes must be known before attempting to adjust or to repair axle shafts or the rear axle case assembly. Rear axle ratio, differential type, manufacturer, and build date information is stamped on the right axle tube on the forward side.

Labeling - Anti-Theft

Notice

The anti-theft label found on some major body panels **MUST** be covered before performing any painting, rustproofing or undercoating procedures. The mask must also be removed following those procedures. Failure to follow these precautionary steps may result in liability for violation of the Federal Vehicle Theft Prevention Standard, and subject the vehicle owner to possible suspicion that the part was stolen.

Federal law requires General Motors (GM) to affix a label to certain parts on selected vehicles with the Vehicle Identification Number (VIN). The purpose of this law is to reduce the number of motor vehicle thefts by helping in the tracing and recovery of parts from stolen vehicles. The certification label on the driver's door qualifies as a theft deterrent label.

The theft deterrent label will be permanently affixed to an interior surface of the part and will contain the complete VIN. The label on replacement parts will contain the letter R, the manufacturer's logo, and the acronym for the Department of Transportation (DOT). **DO NOT** deface, or remove these labels.

RPO Code List

The production/process codes provide the description of the Regular Production Options (RPOs) used on the vehicle. The RPO list is printed on the Service Parts Identification Label. The following is a list of the RPO abbreviations and the description of each:

RPO Code	Description
AB2	Window: Side Body, Stationary, Left Side
AG1	Seat Adjuster: Power, 6-way, Driver
AG2	Seat Adjuster: Power, 6-way, Passenger
AJ1	Windows: Deep Tint, all Except W/S and DRS
AL4	Seat: Rear Bucket
ANO	Seat Adjuster: Manual, 6-way, Lumbar, Driver and Passenger
AP2	Restraint: RR Shoulder Belt, Anchor, Delete
AP9	Net: Convenience
AQ4	Seat: Rear
AR1	Restraint System, Delete
ATZ	Seat, Right Rear, Delete
AU0	Lock Control: Remote Entry
AU3	Lock Control: Side Door, Electric
AU5	Lock Control: Remote Entry, Low Power
AV5	Seat: Front Bucket, High Back
A08	Window: Body, Right Side
A12	Window: Rear, Stationary, Back Door
A13	Window: Side Door, Stationary
A18	Window: Rear Door, Swing Out
A19	Window: Rear Side Door, Swing Out
A31	Window: Power Operated, Side
A57	Seat: Passenger, Auxiliary, Folding
BAG	Parts Package: Export
BAL	Plant Code: Baltimore, MD, GM T&B
BA8	Compartment: Front Seat, Stowage, Passenger
BVE	Running Boards: Side
BX2	Molding: Body Side, Lower, Extra Wide
B37	Covering: Floor Mats, Front & Rear, Auxiliary
B88	Molding: B/S Custom
C36	Heater: Auxiliary
C49	Defogger: Rear Window, Electric
C5G	5600 Lbs. GVW Rating
C5M	6100 Lbs. GVW Rating
C6M	5950 Lbs. GVW Rating
C69	Air Conditioning: Rear
C7X	5850 Lbs. GVW Rating
C95	Lamp: Interior, Roof, Courtesy and Dual Reading
DH2	Mirror: I/S, Front Vanity LH & RH, Illum., with Dual Sunshade
DK6	Console: Roof, Interior
DK8	Console: Roof Interior, Deluxe
D34	Mirror: Inside, Sunshade
D44	Mirror: Outside, Painted
D48	Mirror: Outside, Remote Control, Electric, Painted
E54	Body Equipment: Rear Door, w/End Gate Window
FE9	Certification Emissions, Federal

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GT4	Rear Axle: 3.73 Ratio
GU5	Rear Axle: 3.23 Ratio
GU6	Rear Axle: 3.42 Ratio
G80	Rear Axle: Positraction
JM4	Brake System: Power, Front Disc, Rear Drum, Antilock Front & Rear
K05	Heater: Engine Coolant
K34	Cruise Control: Automatic, Electronic
K53	Fuel Sender Robust Fuel System
K60	Generator: 100 Ampere
K68	Generator: 105 Ampere
L35	Engine: 4.3 Liter V6, CPI
M30	Transmission: Hydra-Matic 4L60-E, 4-Speed Automatic, Electronic
NA3	Emission System: Japan
NB7	Emission System: California, TLEV
NC1	Emission System: California, LEV
NF2	Emission System: Federal, Tier 1
NM2	Emission System: Export
NN8	Emission System: Override Unleaded Fuel, Export
NP5	Steering Wheel: Leather Wrapped
N12	Exhaust System: Rear Exit
N33	Steering Column: Tilt Type
N46	Steering Wheel: Four Spokes
PA6	Wheel: Styled, Painted
PC2	Wheel: 15 x 6.5, Chrome, Styled
PF3	Wheel, 15 x 6.5, Aluminum
QCM	Tire: All, P215/75/R15 WOL R/PE ST TL ALS 100S
QCU	Tire: All, P215/75/R15/N BL R/PE ST TL ALS
R4L	Tire Brand Front: Michelin
S4L	Tire Brand Rear: Michelin
TL1	Grille: Special
TR2	Lamp Turn Signal: Enlarged
T62	Lighting: Daytime Running, Delete
T72	Headlamps LH Rule of the Road
T84	Headlamps: RH Rule of Road, E Mark
T89	Lamp: Tail & Stop, Export
UC2	Speedometer: Instrument, Kilo & Miles, Kilo Odometer, Positive Bias
UD4	Alarm: Vehicle Speed, 120 KPH
UG1	Opener: Garage Door, Universal
UK1	Radio: Frequencies, Japan
UK6	Radio Control: Rear Seat & Earphone Jacks
UL0	Radio: AM/FM Stereo, Seek/Scan, Auto Reverse Cassette, Auto Tone, Music Search
UL2	Radio: Frequencies, Europe
UL5	Radio: Delete
UL8	Frequencies Saudi Arabian
UM6	Radio: AM/FM Stereo, Seek/Scan, Auto Reverse Cassette, Clock, ETR
UM7	Radio: AM/FM Stereo, Seek/Scan, Clock, ETR
UNO	Radio: AM/FM Stereo, Seek/Scan, Compact Disc, Auto Tone, Clock, ETR
UP0	Radio: AM/FM Stereo, Seek/Scan, Auto Reverse, Music Search, Cassette, Compact Disc Player, Auto Tone, Clock, ETR
UQ1	Radio: Provisions for Stereo
UY7	Wiring Harness: Truck Trailer HD
U19	Speedometer: Instrument, Kilo & Miles, Kilo Odometer

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U73	Antenna: Fixed, Radio
VB1	Label: Shipping, Japan
VC4	Label Price/Fuel Economy, Puerto Rico
VC5	Label Shipping, Except US, US Possessions, or Japan
VC7	Label Price/Fuel Economy, Guam
VE1	Provision: Options, Japan
VE6	Bumper: Front & Rear, Impact, Painted
VG8	Label: Vehicle Buyer Notice
VJ1	License Plate: RR Mounting Pkg, Japanese
VK5	Seat: Temporary, For Shipping
VL6	License Plate: Front Mounting Pkg, Japanese
VPH	Vehicle Preparation: Overseas Delivery
VP6	Noise Control
VR4	Trailer Hitch: Weight Distributing Platform
VR6	Hook: Tie Down
VT3	Bumper: RR Export
VXS	Vehicle: Complete
VXT	Vehicle: Incomplete
V10	Provisions: Cold Climate
V54	Luggage Carrier: Roof, Painted
V73	Vehicle Statement: US/Canada
V78	Vehicle Statement: Delete
V87	Vehicle Statement, Gulf States Organization
V98	Factory Delivery Processing
WX7	Wiring Provisions
XCM	Tire: Front, P215/75/R15 WOL R/PE ST TL ALS 100S
XCU	Tire: Front, P215/75/R15/N BL R/PE ST TL ALS
X88	Conversion Nameplate: Chevrolet
YB9	Paint: Interior, Delete
YCM	Tire: Rear, P215/75/R15 WOL R/PE ST TL ALS 100S
YCU	Tire: Rear, P215/75/R15/N BL R/PE ST TL ALS
YC5	Convenience Package: Decor Level #5
YC6	Convenience Package: Decor Level #6
YC7	Convenience Package: Decor Level #7
YF7	Sales Package: Recreational Vehicle Upfitter
YG6	HVAC System: Air Conditioning, Not Desired
ZA6	Package Price Leader
ZA7	Package Price Leader: Canadian
ZP0	Seating Arrangement: Temporary Driver
ZP7	Seating Arrangement: Seven Passenger
ZP8	Seating Arrangement: Eight Passenger
ZQ2	Sales Package: Driver Convenience
ZW2	Window Package: RR Doors
ZW3	Window Pkg: Side RR DR, RR DR
ZW6	Window Pkg: Complete Body
ZW9	Body Equipment: Base Body or Chassis
ZX2	Seating Arrangement: Driver & Passenger, Highback
ZY1	Color Combination: Solid
ZY2	Color Combination: Two-Tone
Z49	Base Equipment: Canadian Mandatory
Z5X	Mirror Provisions, Arabic Language
Z82	Trailer Provisions: Special Equipment, Heavy Duty

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Z88	Conversion Nameplate: GMC
O1U	Primary Colors Exterior, Special, (91)
1SA	Package Option 01
1SB	Package Option 02
1SC	Package Option 03
1SD	Package Option 04
1SE	Package Option 05
1SF	Package Option 06
1SG	Package Option 07
1SH	Package Option 08
1SJ	Package Option 09
1SK	Package Option 10
1SL	Package Option 11
1SM	Package Option 12
1SN	Package Option 13
1SP	Package Option 14
1SQ	Package Option 15
1SR	Package Option 16
1SS	Package Option 17
1ST	Package Option 18
1SU	Package Option 19
1SV	Package Option 20
1SW	Package Option 21
1SX	Package Option 22
1SY	Package Option 23
10Q	Molding Color: Ghost White
10U	Primary Color: Exterior, Ghost White
14U	Primary Color: Exterior, Storm Gray Metallic
17A	Stripe Color: Accent, Silvermist
17Q	Molding Color: Silvermist Metallic
17U	Primary Color: Exterior, Silvermist Metallic
2CU	Tire: Front P215/75R15/N BW R/PE ST TL ALS
25U	Primary Color: Exterior, Cadet Blue Metallic
26G	Trim Combination: Cloth, Navy (G)
26I	Interior Trim: Navy (I)
26W	Trim Combination: Vinyl, Navy (W)
3CU	Tire: Rear P215/75R15/N BW R/PE ST TL ALS
36Q	Molding Color: Medium Dark Teal Metallic
36U	Primary Color: Exterior, Medium Dark Teal Metallic
5CU	Tire: All P215/75R15/N BW R/PE ST TL ALS
52G	Trim Combination: Cloth, Light Neutral (G)
52H	Trim Combination: Cloth, Medium Neutral II (H)
52I	Interior Trim: Light Neutral (I)
522	Trim Combination: Leather, Light Neutral II (2)
53U	Primary Color: Exterior, Light Toreador Red Metallic
55A	Stripe Color: Light Autumnwood Metallic
55Q	Molding Color: Light Autumnwood Metallic
55U	Primary Color: Exterior, Light Autumnwood Metallic
57U	Primary Color: Exterior, Forest Green Metallic
6UA	Component: Front LH Computer Select Suspension
6UB	Component: Front LH Computer Select Suspension
6UC	Component: Front LH Computer Select Suspension

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6XB	Component: Front LH Computer Select Suspension
69Q	Molding Color: Copper Metallic
69U	Primary Color: Exterior, Copper Metallic
7UA	Component: Front RH Computer Select Suspension
7UB	Component: Front RH Computer Select Suspension
7UC	Component: Front RH Computer Select Suspension
7XB	Component: Front RH Computer Select Suspension
76A	Stripe Color: Accent, Dark Bronzemist
76Q	Molding Color: Dark Bronzemist Metallic
76U	Primary Color: Exterior, Dark Bronzemist Metallic
8R1	Headliner, Delete
92G	Trim Combination: Cloth, Medium Dark Pewter
92H	Trim Combination: Cloth, Medium Dark Pewter
92I	Interior Trim: Medium Dark Pewter
92W	Trim Combination: Vinyl, Med Dark Pewter (W)
922	Trim Combination: Leather, Medium Dark Pewter (2)

Technical Information

Maintenance and Lubrication

Capacities - Approximate Fluid

Application	Specification	
	Metric	English
Cooling System		
Engine Cooling, 4.3L (VIN X)	11.5 L	12.1 qt
Engine Cooling, 4.3L (VIN W)	11.5 L	12.1 qt
Engine Crankcase		
With Filter	4.26 L	4.5 qt
Fuel System		
Fuel Tank – Steel	71.9 L	19 gal
Fuel Tank - Plastic	68.1 L	18 gal
Transmission		
4L60-E After Filter/Bottom Pan Removal	4.7 L	4.5 qt
After Complete Overhaul	10.6 L	11 qt
Axles		
Front Axle	1.2 L	1.5 qt
Rear Axle – 7.625	1.655 L	1.75 qt
Rear Axle – 8.6	1.85 L	2.0 qt

Maintenance Items

Application	Part Number
Air Cleaner	
4.3L (VIN X)	AC Type A773C
4.3L (VIN W)	AC Type 1163C
Engine Oil Filter	
4.3L (VIN X and W)	AC Type PF-52
PCV Valve	
4.3L (VIN X)	AC Type CV789C
4.3L (VIN W)	AC Type CV769C
Spark Plugs	
4.3L (VIN X)	AC Type CR43TSM (GAP 1.14 mm, 0.045 in)
4.3L (VIN W)	AC Type CR43TSM (GAP 1.52 mm, 0.060 in)
Fuel Filter	
4.3L (VIN X)	AC Type GF-481
4.3L (VIN W)	AC Type GF-645

Radiator Cap	
4.3L (VIN X)	AC Type R27
4.3L (VIN W)	AC Type R27

Fluid and Lubricant Recommendations

Usage	Fluid/Lubricant
Engine Oil	Engine Oil with the American Petroleum Institute Certified For Gasoline Engines Starburst symbol of the proper viscosity.
Engine Coolant	A 50/50 mixture of clean, drinkable water and use only GM Goodwrench DEX-COOL® or Havoline® DEX-COOL® (orange-colored, silicate-free) coolant conforming to GM specification 6277M.
Engine Coolant Supplemental Sealer	DO NOT use cooling system seal tabs, or similar compounds, unless otherwise instructed. The use of cooling system seal tabs, or similar compounds, may restrict coolant flow through the passages of the cooling system or the engine components. Restricted coolant flow may cause engine overheating and/or damage to the cooling system or the engine components/assembly.
Hydraulic Brake System	Delco Supreme 11® Brake Fluid (GM P/N 12377967 or equivalent DOT-3 Brake Fluid).
Windshield Washer Solvent	GM Optikleen® Washer Solvent (GM P/N 1051515 or equivalent).
Hydraulic Clutch System	Hydraulic Clutch Fluid (GM P/N 12345347 or equivalent DOT-3 Brake Fluid).
Park Brake Cable Guides	Chassis Lubricant (GM P/N 12377985 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Power Steering System	GM Power Steering Fluid (GM P/N 1052884-1 pint, 1050017-1 quart, or equivalent).
Manual Transmission	<ul style="list-style-type: none"> L4 engine: Manual Transmission Fluid with 5% Friction modifier (GM P/N 12377916). V6 engine: Synchromesh Transmission Fluid (GM P/N 12345349).
Automatic Transmission	DEXRON®-III Automatic Transmission Fluid with a G-License Number (G-xxxx). The G-License Number will be found on the back label.
Key Lock Cylinders	Multi-Purpose Lubricant, Superlube® (GM P/N 12346241 or equivalent).
Chassis Lubrication	Chassis Lubricant (GM P/N 12377985 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Front Wheel Bearings-RWD	Wheel Bearing Lubricant meeting requirements of NLGI Grade 2, Category GC or GC-LB (GM P/N 1051344 or equivalent).
Rear Axle (Standard)	Axle Lubricant (GM P/N 1052271) or SAE 80W-90 GL-5 Gear Lubricant.
Rear Axle (Locking Differential)	Axle Lubricant, use only GM Part No. 1052271 (in Canada use Part No. 10950849). Do not add friction modifier.
Transfer Case	DEXRON®-III Automatic Transmission Fluid.
Automatic Transfer Case	Automatic Transfer Case Fluid (GM P/N 12378396 or equivalent).
Column Shift Linkage	Chassis Lubricant (GM P/N 12377985 or equivalent) meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Floor Shift Linkage	Chassis Lubricant (GM P/N 12377985 or equivalent) meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Propeller Shaft Slip Splines and Universal Joints	Chassis Lubricant (GM P/N 12377985 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Clutch Pushrod to Fork Joint	Chassis Lubricant (GM P/N 12377985 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Constant Velocity Universal Joint	Chassis Lubricant (GM P/N 12377895 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.

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Hood Latch Assembly, Pivots and Spring Anchor, Release Pawl	Lubriplate® Lubricant Aerosol (GM P/N 12346293 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Hood and Door Hinges	Multi-Purpose Lubricant, Superlube® (GM P/N 12346241 or equivalent).
Endgate Mounted Spare Tire Carrier (if equipped), Outer Endgate Handle Pivot Points and Hinges	Multi-Purpose Lubricant, Superlube® (GM P/N 12346241 or equivalent).
Weatherstrip conditioning	Dielectric Silicone Grease (GM P/N 12345579 or equivalent).
Weatherstrip squeaks	Synthetic Grease with Teflon, Loctite Superlube® (GM P/N 12371287 or equivalent).

Tire and Wheel Runout Specifications

Application	Specification	
	Metric	English
Aluminum Wheel		
Lateral	0.762 mm	0.030 in
Radial	0.762 mm	0.030 in
Steel Wheel		
Lateral	1.143 mm	0.045 in
Radial	1.015 mm	0.040 in
Tire and Wheel Assembly (Radial and Lateral)		
Off-Vehicle	1.27 mm	0.05 in
On-Vehicle	1.52 mm	0.06 in
Wheel Stud	0.25 mm	0.01 in
Wheel Hub	0.130 mm	0.005 in

Descriptions and Operations

Power Steering System Description and Operation w/o Electro-Hydraulic Steering

The hydraulic power steering pump is a constant displacement vane-type pump that provides hydraulic pressure and flow for the power steering gear. The hydraulic power steering pumps are either belt-driven or direct-drive, cam-driven.

The power steering fluid reservoir holds the power steering fluid and may be integral with the power steering pump or remotely located. The following locations are typical locations for the remote reservoir:

- Mounted to the front of the dash panel
- Mounted to the inner fender
- Mounted to a bracket on the engine

The 2 basic types of power steering gears are listed below:

- A recirculating ball system
- A rack and pinion system

In the recirculating ball system, a worm gear converts steering wheel movement to movement of a sector shaft. A pitman arm attached to the bottom of the sector shaft actually moves one tie rod and an intermediate rod move the other tie rod.

In the rack and pinion system, the rack and the pinion are the 2 components that convert steering wheel rotation to lateral movement. The steering shaft is attached to the pinion in the steering gear. The pinion rotates with the steering wheel. Gear teeth on the pinion mesh with the gear teeth on the rack. The rotating pinion moves the rack from side to side. The lateral action of the rack pushes and pulls the tie rods in order to change the direction of the vehicle's front wheels.

The power steering pressure hose connects the power steering pump union fitting to the power steering gear and allows pressurized power steering fluid to flow from the pump to the gear.

The power steering return hose returns fluid from the power steering gear back to the power steering fluid reservoir. The power steering return line may contain an integral fin-type or line-type power steering fluid cooler.

In a typical power steering system, a pump generates hydraulic pressure, causing fluid to flow, via the pressure hose, to the steering gear valve assembly. The steering gear valve assembly regulates the incoming fluid to the right and left chambers in order to assist in right and left turns.

Turning the steering wheel activates the valve assembly, which applies greater fluid pressure and flow to 1 side of the steering gear piston, and lower pressure and flow to the other side of the piston. The pressure assists the movement of the gear piston. Tie rods transfer this force to the front wheels, which turn the vehicle right or left.

Steering Linkage Description and Operation

The steering linkage connects both of the front wheels to the steering gear through the pitman arm. The steering linkage consists of the following components:

- The inner tie rod
- The outer tie rod
- The relay rod
- The connecting rod
- The idler arm(s)

- The pitman arm

The inner and the outer tie rods attach to the steering knuckle and the relay rod by ball studs. The two idler arms support the relay rod. The idler arms pivot on a support that is attached to the frame rail. The idler arm support is threaded in order to allow the height adjustment of the arm on the support. The height adjustment allows the linkage to clear the suspension as the linkage moves from lock to lock. The original equipment is installed at a preset specification.

The relay rod is attached to the connecting rod. The connecting rod is used in order to maintain the proper geometry in the steering linkage. The connecting rod attaches to, and is supported by, the pitman arm.

The pitman arm is driven by the steering gear. Each joint has a lubrication fitting. The inner pivots use prevailing torque nuts, the outer tie rods use castellated nuts. Replace the prevailing torque nuts and cotter pins any time service removal is necessary.

The overall condition of the steering linkage affects the steering performance. Improper, and possibly dangerous steering action will result if any of the steering linkage displays the following conditions:

- Bent
- Damaged
- Worn
- Poorly lubricated

Check the steering geometry and the front wheel alignment whenever any steering linkage components are repaired or replaced.

Steering Wheel and Column - Standard Description and Operation

The steering wheel and column has 4 primary functions:

- Vehicle steering
- Vehicle security
- Driver convenience
- Driver safety

Vehicle Steering

The steering wheel is the first link between the driver and the vehicle. The steering wheel is fastened to a steering shaft within the column. At the lower end of the column, the intermediate shaft connects the column to the steering gear.

Vehicle Security

Theft deterrent components are mounted and designed into the steering column. The following components allow the column to be locked in order to minimize theft:

- The ignition switch
- The steering column lock
- The ignition cylinder

Driver Convenience

The steering wheel and column may also have driver controls attached for convenience and comfort. The following controls may be mounted on or near the steering wheel or column.

- The turn signal switch
- The hazard switch

- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad/cruise control switch
- The redundant radio/entertainment system controls
- The tilt or tilt/telescoping functions
- The HVAC controls

Driver Safety

The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The mounting capsules break away from the mounting bracket in the event of an accident.

Suspension Description and Operation

Front Suspension

The front suspension has 2 primary purposes:

- Isolate the driver from irregularities in the road surface.
- Define the ride and handling characteristics of the vehicle.

The front suspension allows each wheel to compensate for changes in the road surface without affecting the opposite wheel. Each wheel independently connects to the frame with a steering knuckle, ball joint assemblies, and upper and lower control arms.

The control specifically allow the steering knuckles to move in a three-dimensional arc. Two tie rods connect to steering arms on the knuckles and an intermediate rod. These operate the front wheels.

The rear wheel drive vehicles have coil chassis springs. These springs are mounted between the spring housings on the frame and the lower control arms. Shock absorbers are mounted inside the coil springs. The coil springs attach to the lower control arms with bolts and nuts.

The upper part of each shock absorber extends through the upper control arm frame bracket, and the shock absorber secures with two grommets, two retainers, and a nut.

A spring stabilizer shaft controls the side roll of the front suspension. This shaft is mounted in rubber insulators that are held by brackets to the frame side rails. The ends of the stabilizer shaft connect to the lower control arms with link bolts. Rubber insulators isolate these link bolts.

A ball joint assembly is riveted and bolted to the outer end of the upper control arm. A castellated nut and a cotter pin join the steering knuckle to the upper ball joint.

The inner ends of the lower control arm have pressed-in bushings. The bolts pass through the bushings and join the arm to the frame. The lower ball joint assembly is a press fit in the lower control arm and attaches to the steering knuckle with a castellated nut and a cotter pin.

Ball socket assemblies have rubber grease seals. These seals prevent entry of moisture and dirt, and these seals prevent damage to the bearing surfaces.

Automatic Four Wheel Drive models have a front suspension that consists of the control arms, a stabilizer shaft, a shock absorber, and a right and left side torsion bar. The torsion bars replace the conventional coil springs. The lower control arm attaches to the front end of the torsion bar. The rear end of the torsion bar mounts on an adapter and adjustable arm at the torsion bar crossmember. This arm adjustment controls the vehicle trim height.

Rear Suspension

The components of the rear suspension use a leaf spring and solid rear axle suspension system.

The front ends of the springs are attached to the frame at the hangers, through rubber bushings. The rear ends of the leaf springs are connected to the frame with shackle assemblies. The shackle assemblies allow the leaf springs to change positions in response to different road and payload conditions. The leaf springs are connected to the rear axle with an anchor plate, the lower plate, the U-bolts, and the attaching hardware. The shock absorbers are attached to the rear axle and the frame. The shock absorbers dampen or smooth road inputs.

An optional spring steel stabilizer shaft helps minimize body roll and is available as part of the sport suspension package. The stabilizer shaft is connected to the rear axle and the frame with the rubber insulators, the clamps, and the link assemblies.

Wheels and Tires

General Description

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

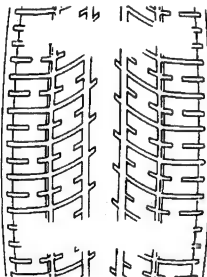
The following factors have an important influence on tire life:

- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

Tread Wear Indicators Description



The original equipment tires have tread wear indicators that show when you should replace the tires.

The location of these indicators are at 72 degree intervals around the outer diameter of the tire. The indicators appear as a 6 mm (0.25 in) wide band when the tire tread depth becomes 1.6 mm (2/32 in).

Metric Wheel Nuts and Bolts Description

Metric wheel/nuts and bolts are identified in the following way:

- The wheel/nut has the word Metric stamped on the face.
- The letter M is stamped on the end of the wheel bolt.

The thread sizes of metric wheel/nuts and the bolts are indicated by the following example: M12 x 1.5.

- M = Metric
- 12 = Diameter in millimeters
- 1.5 = Millimeters gap per thread

Tire Inflation Description

When you inflate the tires to the recommended inflation pressures, the factory-installed wheels and tires are designed in order to handle loads to the tire's rated load capacity. Incorrect tire pressures, or under-inflated tires, can cause the following conditions:

- Vehicle handling concerns
- Poor fuel economy
- Shortened tire life
- Tire overloading

Inspect the tire pressure when the following conditions apply:

- The vehicle has been sitting at least 3 hours.
- The vehicle has not been driven for more than 1.6 km (1 mi).
- The tires are cool.

Inspect the tires monthly or before any extended trip. Adjust the tire pressure to the specifications on the tire label. Install the valve caps or the extensions on the valves. The caps or the extensions keep out dust and water.

The kilopascal (kPa) is the metric term for pressure. The tire pressure may be printed in both kilopascal (kPa) and psi. One psi equals 6.9 kPa.

Inflation Pressure Conversion (Kilopascals to PSI)

kPa	psi	kPa	psi
140	20	215	31
145	21	220	32
155	22	230	33
160	23	235	34
165	24	240	35
170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

Tires with a higher than recommended pressure can cause the following conditions:

- A hard ride
- Tire bruising
- Rapid tread wear at the center of the tire

Tires with a lower than recommended pressure can cause the following conditions:

- A tire squeal on turns
- Hard steering

- Rapid wear and uneven wear on the edge of the tread
- Tire rim bruises and tire rim rupture
- Tire cord breakage
- High tire temperatures
- Reduced vehicle handling
- High fuel consumption
- Soft riding

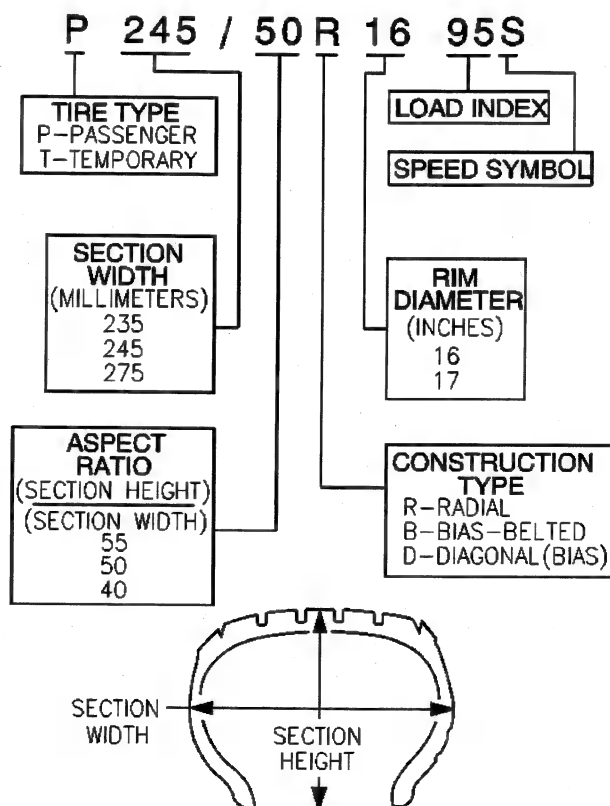
Unequal pressure on the same axle can cause the following conditions:

- Uneven braking
- Steering lead
- Reduced vehicle handling

Tire Inflation Pressure Specifications

Application	Specification	
	Metric	English
Front and Rear Tires	240 kPa	35 psi
Compact spare	420 kPa	60 psi

P-Metric Sized Tires Description



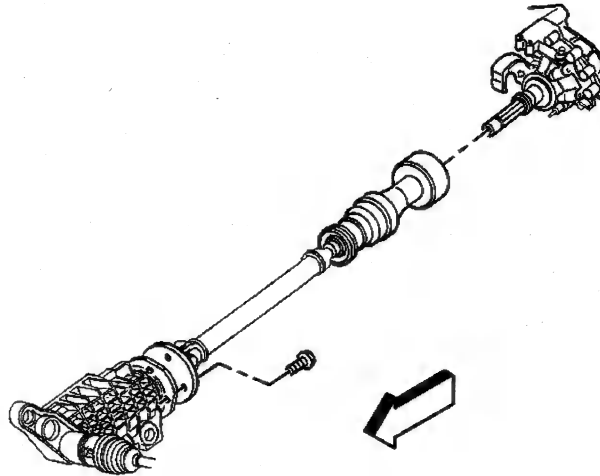
Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria (TPC) specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle. Consult a tire

dealer if you must replace the P-metric tire with other sizes. Tire companies can best recommend the closest match of alphanumeric to P-metric sizes within their own tire lines.

Driveline System Description and Operation

Driveline/Axle – Propeller Shaft

Constant Velocity Joint Description



A Constant Velocity (CV) universal joint propeller shaft transmits power from the transfer case to the front differential.

The constant velocity joint allows the driveline angle to adjust according to the up and down movement of the vehicle without disturbing the power flow. The joint consists of an outer bearing retainer and flange, spring, cap, circlip, inner bearing assembly, and wire ring. The inner bearing assembly includes a bearing cage, six ball bearings, and an inner race.

Propeller Shaft Description and Operation

The front propeller shaft consists of the following components:

- Propeller shaft tube
- Universal joint
- Flange yoke
- Constant velocity joint

The rear propeller shaft consists of the following components:

- Propeller shaft tube
- 2 universal joints
- Slip yoke

Front Propeller Shaft Operation

The front propeller shaft connects the transfer case to the front axle. It transmits the rotating force from the transfer case to the front axle when the transfer case is engaged.

Rear Propeller Shaft Operation

The rear propeller shaft connects the transmission or transfer case to the rear axle. It transmits the rotating force from the transmission or transfer case to the rear axle.

Propeller Shaft Phasing Description

The propeller shaft is designed and built with the yoke lugs or ears in line with each other. This produces the smoothest running shaft possible. A propeller shaft designed with built in yoke lugs in line is known as in - phase. An out of phase propeller shaft often causes vibration. The propeller shaft generates vibration from speeding up and slowing down each time the universal joint goes around. The vibration is the same as a person snapping a rope and watching the wave reaction flow to the end. An in phase propeller shaft is similar to 2 persons snapping a rope at the same time and watching the waves meet and cancel each other out. A total cancellation of vibration produces a smooth flow of power in the drive line. All splined shaft slip yokes are keyed in order to ensure proper phasing.

Universal Joint Description

The universal joint is connected to the propeller shaft. The universal consist of 4 caps with needle bearings and grease seals mounted on the trunnions of a cross or spider. These bearings and caps are greased at the factory and no periodic maintenance is required. The bearings and caps are pressed into the yokes and held in place with snap rings, except for 2 bearings on some models witch are strapped onto the pinion flange of the differential. Universal joints are designed to handle the effects of various loads and rear axle windup conditions during acceleration and braking. The universal joint operates efficiently and safely within the designed angle variations. when the design angles are exceeded, the operational life of the joint decreases.

Front Drive Axle Description and Operation

The Front Drive Axle consist of the following components:

- Differential Carrier Housing
- Differential Assembly
- Left and Right Output Shafts
- Inner Axle Shaft Housing
- Inner Axle Shaft

The front axle on the four-wheel-drive model vehicle does not have a central disconnect feature. The axle uses a conventional ring and pinion gear set in order to transmit the driving force of the engine to the wheels. The open differential allows the wheels to turn at different rates of speed while the axle continues to transmit the driving force. This prevents tire scuffing when going around corners and premature wear on internal axle parts. The ring and pinion set and the differential are contained within the carrier. The axle identification number on top of the differential carrier assembly or on a label on the right half of differential carrier assembly. The drive axles are completely flexible assemblies consisting of inner and outer constant velocity CV joints protected by thermoplastic boots and connected by a wheel drive shaft.

Rear Drive Axle Description and Operation

Rear Axles for this vehicle consist of the following components:

- Differential axle housing
- Differential carrier
- Right and left axle tubes

- Right and left axle shafts

An open differential has a set of 4 gears. Two are side gears and 2 are pinion gears. Some differentials have more than 2 pinion gears. Each side gear is splined to an axle shaft so each axle shaft ; so that each axle shaft turns when its side gear rotates. The pinion gears are mounted on a differential pinion shaft, and the gears are free to rotate on this shaft. The pinion shaft is fitted into a bore in the differential case and is at right angles to the axle shafts. Power is transmitted through the differential as follows: the drive pinion rotates the ring gear. The ring gear being bolted to the differential case, rotates the case. The differential pinion, as it rotates the case, forces the pinion gears against the side gears. When both wheels have equal traction, the pinion gears do not rotate on the pinion shaft because of input force on the pinion gear is equally divided between the 2 side gears. Therefore, the pinion gears revolve with the pinion shaft, but do not rotate around the shaft itself. The side gears, being splined to the axle shafts and in mesh with the pinion gears rotate the axle shafts. If a vehicle were always driven in a straight line, the ring and pinion gears would be sufficient. The axle shaft could be solidly attached to the ring gear and both driving wheels would turn at equal speed. However, if it became necessary to turn a corner, the tires would scuff and slide because the differential allows the axle shafts to rotate at different speeds. When the vehicle turns a corner, the inner wheel turns slower than the out wheel and slows its rear axle side gear (as the shaft is splined to the side gear). The rear axle pinion gears will roll around the slowed rear axle side gear, driving the rear axle side gear wheel faster.

Locking Differential Description and Operation

The locking differential consists of the following components:

- Differential case - 1 or 2 piece
- Locking differential spider - 2 piece case only
- Pinion gear shaft - 1 piece case only
- Differential pinion gear shaft lock bolt - 1 piece case only
- 2 clutch discs sets
- Locking differential side gear
- Thrust block
- Locking differential clutch disc guides
- Differential side gear shim
- Locking differential clutch disc thrust washer
- Locking differential governor
- Latching bracket
- Cam plate assembly
- Differential pinion gears
- Differential pinion gear thrust washers

The optional locking differential (RPO G80) enhances the traction capability of the rear axle by combining the characteristics of a limited-slip differential and the ability of the axle shafts to "lock" together when uneven traction surfaces exist. The differential accomplishes this in 2 ways. First by having a series of clutch plates at each side of the differential case to limit the amount of slippage between each wheel. Second, by using a mechanical locking mechanism to stop the rotation of the right differential side gear, or the left differential side gear on the 10.5 inch axle, in order to transfer the rotating torque of the wheel without traction to the wheel with traction. Each of these functions occur under different conditions.

Limited-Slip Function

Under normal conditions, when the differential is not locked, a small amount of limited-slip action occurs. The gear separating force developed in the right-hand (left-hand side on 10.5 inch axle) clutch pack is primarily responsible for this.

The operation of how the limited-slip function of the unit works can be explained when the vehicle makes a right-hand turn. Since the left wheel travels farther than the right wheel, it must rotate faster than the

ring gear and differential case assembly. This results in the left axle and left side gear rotating faster than the differential case. The faster rotation of the left-side gear causes the pinion gears to rotate on the pinion shaft. This causes the right-side gear to rotate slower than the differential case.

Although the side gear spreading force produced by the pinion gears compresses the clutch packs, primarily the right side, the friction between the tires and the road surface is sufficient to overcome the friction of the clutch packs. This prevents the side gears from being held to the differential case.

Locking Function

Locking action occurs through the use of some special parts:

- A governor mechanism with 2 flyweights
- A latching bracket
- The left side cam plate and cam side gear

When the wheel-to-wheel speed difference is 100 RPM or more, the flyweights of the governor will fling out and one of them will contact an edge of the latching bracket. This happens because the left cam side gear and cam plate are rotating at a speed different, either slower or faster, than that of the ring gear and differential case assembly. The cam plate has teeth on its outer diameter surface in mesh with teeth on the shaft of the governor.

As the side gear rotates at a speed different than that of the differential case, the shaft of the governor rotates with enough speed to force the flyweights outward against spring tension. One of the flyweights catches its edge on the closest edge of the latching bracket, which is stationary in the differential case. This latching process triggers a chain of events.

When the governor latches, it stops rotating. A small friction clutch inside the governor allows rotation, with resistance, of the governor shaft while one flyweight is held to the differential case through the latching bracket. The purpose of the governor's latching action is to slow the rotation of the cam plate as compared to the cam side gear. This will cause the cam plate to move out of its detent position.

The cam plate normally is held in its detent position by a small wave spring and detent humps resting in matching notches of the cam side gear. At this point, the ramps of the cam plate ride up on the ramps of the cam side gear, and the cam plate compresses the left clutch pack with a self-energizing action.

As the left clutch pack is compressed, it pushes the cam plate and cam side gear slightly toward the right side of the differential case. This movement of the cam side gear pushes the thrust block which compresses the right-hand side gear clutch pack.

At this point, the force of the self-energizing clutches and the side gear separating force combine to hold the side gears to the differential case in the locking stage.

The entire locking process occurs in less than 1 second. The process works with either the left or right wheel spinning, due to the design of the governor and cam mechanism. A torque reversal of any kind will unlatch the governor, causing the cam plate to ride back down to its detent position. Cornering or deceleration during a transmission shift will cause a torque reversal of this type. The differential unit returns to its limited-slip function.

The self-energizing process would not occur if it were not for the action of one of the left clutch discs. This energizing disc provides the holding force of the ramping action to occur. It is the only disc which is splined to the cam plate itself. The other splined discs fit on the cam side gear.

If the rotating speed of the ring gear and differential case assembly is high enough, the latching bracket will pivot due to centrifugal force. This will move the flyweights so that no locking is permitted. During vehicle driving, this happens at approximately 32 km/h (20 mph) and continues at faster speeds.

When comparing the effectiveness of the locking differential, in terms of percent-of-grade capability to open and limited-slip units, the locking differential has nearly 3 times the potential of the limited-slip unit under the same conditions.

Locking Differential Torque-Limiting Disc

The locking differential design was modified in mid-1986 to include a load-limiting feature to reduce the chance of breaking an axle shaft under abusive driving conditions. The number of tangs on the energizing disc in the left-hand clutch pack was reduced allowing these tangs to shear in the event of a high-torque engagement of the differential locking mechanism.

At the time of failure of the load-limiting disc, there will be a loud bang in the rear axle and the differential will operate as a standard differential with some limited-slip action of the clutch packs at low torques.

The service procedure, when the disc tangs shear, involves replacing the left-hand clutch plates and the wave spring. It is also necessary to examine the axle shafts for twisting because at high torques it is possible to not only shear the load-limiting disc, but to also twist the axle shafts.

Braking System Description and Operation

Hydraulic Brake System Description and Operation

System Component Description

The hydraulic brake system consists of the following:

Hydraulic Brake Master Cylinder Fluid Reservoir

Contains supply of brake fluid for the hydraulic brake system.

Hydraulic Brake Master Cylinder

Converts mechanical input force into hydraulic output pressure.

Hydraulic output pressure is distributed from the master cylinder through two hydraulic circuits, supplying diagonally-opposed wheel apply circuits.

Hydraulic Brake Pressure Balance Control System

Regulates brake fluid pressure delivered to hydraulic brake wheel circuits, in order to control the distribution of braking force.

Pressure balance control is achieved through dynamic rear proportioning (DRP), which is a function of the ABS modulator.

Hydraulic Brake Pipes and Flexible Brake Hoses

Carries brake fluid to and from hydraulic brake system components.

Hydraulic Brake Wheel Apply Components

Converts hydraulic input pressure into mechanical output force.

System Operation

Mechanical force is converted into hydraulic pressure by the master cylinder, regulated to meet braking system demands by the pressure balance control system, and delivered to the hydraulic brake wheel circuits by the pipes and flexible hoses. The wheel apply components then convert the hydraulic pressure back into mechanical force which presses linings against rotating brake system components.

Brake Assist System Description and Operation

System Component Description

The brake assist system consists of the following:

Brake Pedal

Receives, multiplies and transfers brake system input force from driver.

Brake Pedal Pushrod

Transfers multiplied input force received from brake pedal to brake booster.

Vacuum Brake Booster

Uses source vacuum to decrease effort required by driver when applying brake system input force.

When brake system input force is applied, air at atmospheric pressure is admitted to the rear of both vacuum diaphragms, providing a decrease in brake pedal effort required. When input force is removed, vacuum replaces atmospheric pressure within the booster.

Vacuum Source

Supplies force used by vacuum brake booster to decrease brake pedal effort.

Vacuum Source Delivery System

Enables delivery and retention of source vacuum for vacuum brake booster.

System Operation

Brake system input force is multiplied by the brake pedal and transferred by the pedal pushrod to the hydraulic brake master cylinder. Effort required to apply the brake system is reduced by the vacuum brake booster.

Disc Brake System Description and Operation

System Component Description

The disc brake system consists of the following components:

Disc Brake Pads

Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

Disc Brake Rotors

Uses mechanical output force applied to friction surfaces from the disc brake pads to slow speed of tire and wheel assembly rotation.

Disc Brake Pad Hardware

Secures disc brake pads firmly in proper relationship to the hydraulic brake calipers. Enables a sliding motion of brake pads when mechanical output force is applied.

Disc Brake Caliper Hardware

Provides mounting for hydraulic brake caliper and secures the caliper firmly in proper relationship to caliper bracket. Enables a sliding motion of the brake caliper to the brake pads when mechanical output force is applied.

System Operation

Mechanical output force is applied from the hydraulic brake caliper pistons to the inner brake pads. As the pistons press the inner brake pads outward, the caliper housings draw the outer brake pads inward. This allows the output force to be equally distributed. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of both the brake pad and brake caliper hardware is essential for even distribution of braking force.

Drum Brake System Description and Operation

System Component Description

The drum brake system consists of the following:

Drum Brake Shoes

Applies mechanical output force (from hydraulic brake wheel cylinders) to friction surface of brake drums.

Brake Drums

Uses mechanical output force applied to friction surface from drum brake shoes to slow speed of tire and wheel assembly rotation.

Drum Brake Hardware

Secures drum brake shoes firmly in proper relationship to hydraulic brake wheel cylinders. Enables sliding motion of brake shoes needed to expand toward friction surface of drums when mechanical output force is applied; provides return of brake shoes when mechanical output force is relieved.

Drum Brake Adjusting Hardware

Provides automatic adjustment of brake shoes to brake drum friction surface whenever brake apply occurs during rearward motion of the vehicle.

System Operation

Mechanical output force is applied from the hydraulic brake wheel cylinder pistons to the top of the drum brake shoes. The output force is then distributed between the primary and secondary brake shoes as the shoes expand toward the friction surface of the brake drums. The brake shoes apply the output force to the friction surface of the brake drums, which slows the rotation of the tire and wheel assemblies. The proper function of both the drum brake hardware and adjusting hardware is essential to the proper distribution of braking force.

Park Brake System Description and Operation

System Component Description

The park brake system consists of the following:

Park Brake Lever Assembly

Receives, multiplies, and transfers park brake system apply input force from operator to park brake cable system.

Releases applied park brake system when lever is returned to at-rest, lowered, position.

Park Brake Cables

Transfers input force received from park brake lever, through park brake cable equalizer, to park brake apply levers.

Park Brake Cable Equalizer

Evenly distributes input force to both the left and right park brake units.

Park Brake Apply Lever

Multiplies and transfers input force to park brake actuator/adjuster.

Park Brake Actuator/Adjuster

Uses multiplied input force from apply lever to expand drum brake shoes toward the friction surface of the brake drum.

Threaded park brake actuators/adjusters are also used to control clearance between the drum brake shoes and the friction surface of the brake drum.

Drum Brake Shoes

Applies mechanical output force from park brake actuator/adjuster to friction surface of the brake drum.

System Operation

Park brake apply input force is received by the park brake lever assembly being applied. The input force is multiplied by the lever assembly, transferred, and evenly distributed, through the park brake cables and the park brake cable equalizer, to the left and right park brake apply levers. The park brake apply levers multiply and transfer the apply input force to the park brake actuators/adjusters which expand the drum brake shoes toward the friction surface of the brake drum in order to prevent the rotation of the rear tire and wheel assemblies. The park brake lever assembly releases an applied park brake system when it is returned to the at-rest, lowered, position.

ABS Description and Operation

Antilock Brake System

When wheel slip is detected during a brake application, the ABS enters antilock mode. During antilock braking, hydraulic pressure in the individual wheel circuits is controlled to prevent any wheel from slipping. A separate hydraulic line and specific solenoid valves are provided for each wheel. The ABS can decrease, hold, or increase hydraulic pressure to each wheel brake. The ABS cannot, however, increase hydraulic pressure above the amount which is transmitted by the master cylinder during braking.

During antilock braking, a series of rapid pulsations is felt in the brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the EBCM responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pedal pulsations are present only during antilock braking and stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During antilock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during antilock operation.

Vehicles equipped with ABS may be stopped by applying normal force to the brake pedal. Brake pedal operation during normal braking is no different than that of previous non-ABS systems. Maintaining a constant force on the brake pedal provides the shortest stopping distance while maintaining vehicle stability.

Engine Description and Operation

Engine Component Description

Balance Shaft

The cast iron balance shaft is mounted in the crankcase above and in-line with the camshaft. A camshaft gear drives the gear attached to the balance shaft. The front end of the balance shaft is supported by a ball-type bearing. The rear end of the balance shaft uses a sleeve-type bearing.

Camshaft

The steel camshaft is supported by four bearings pressed into the engine block. The camshaft timing chain sprocket mounted to the front of the camshaft is driven by the crankshaft sprocket through a camshaft timing chain.

Crankshaft

The cast nodular iron crankshaft is supported by four crankshaft bearings. The number four crankshaft bearing at the rear of the engine is the end thrust bearing. The crankshaft bearings are retained by bearing caps that are machined with the engine block for proper alignment and clearances. The crankshaft position sensor reluctor ring has three lugs used for crankshaft timing and is constructed of powdered metal. The crankshaft position sensor reluctor ring has a slight interference fit onto the crankshaft and an internal keyway for correct positioning.

Cylinder Heads

The cast iron cylinder heads have one intake and one exhaust valve for each cylinder. A spark plug is located between the valves in the side of the cylinder head. The valve guides and seats are integral to the cylinder head. The 4.3L heavy duty applications have pressed in exhaust valve seats. The valve rocker arms are positioned on the valve rocker arm supports and retained by a bolt.

Engine Block

The cast iron engine block has six cylinders arranged in a V shape with three cylinders in each bank. Starting at the front side of the engine block, the cylinders in the left bank are numbered 1-3-5 and cylinders in the right bank are numbered 2-4-6 (when viewed from the rear). The firing order of the cylinders is 1-6-5-4-3-2. The cylinders are encircled by coolant jackets.

Exhaust Manifolds

The cast iron exhaust manifolds direct exhaust gases from the combustion chambers to the exhaust system. The left side exhaust manifold has a port for the EGR valve inlet pipe.

Intake Manifold

The intake manifold is a two-piece design. The upper portion is made from a composite material and the lower portion is cast aluminum. The throttle body attaches to the upper manifold. The lower manifold has an exhaust gas recirculation (EGR) port cast into the manifold for mixture. The (EGR) valve bolts into the lower intake manifold. The Central Sequential Multiport Fuel Injection system uses multiple fuel injectors to meter and distribute fuel to each engine cylinder. The Central (SFI) is retained by a bracket bolted to the lower intake manifold. The fuel meter body also houses the pressure regulator. Metal inlet and outlet fuel lines and nylon delivery tubes connect to the Central (SFI) unit. The delivery tubes independently distribute fuel to each cylinder through nozzles located at the port entrance of each manifold runner where the fuel is atomized.

Piston and Connecting Rod Assemblies

The cast aluminum pistons use two compression rings and one oil control assembly. The piston is a low friction, lightweight design with a flat top and barrel shaped skirt. The piston pins are offset 0.9 mm (0.0354 in) toward the major thrust side (right side) to reduce piston slap as the connecting rod travels from one side of the piston to the other side after a stroke. The piston pins have a floating fit in the piston and are retained by a press fit in the connecting rod. The connecting rods are forged steel. The connecting rods are machined with the rod cap installed for proper clearances and alignments.

Valve Train

Motion is transmitted from the camshaft through the hydraulic roller valve lifters and the tubular valve pushrods to the roller type valve rocker arms. The roller type valve rocker arm pivots on a needle type bearing in order to open the valve. The valve rocker arms for each bank of cylinders are mounted to a one piece valve rocker arm support. Each valve rocker arm is retained on the valve rocker arm support and the cylinder head by a bolt. The hydraulic valve lifters keep all the parts of the valve train in constant contact. Each hydraulic valve lifter acts as an automatic adjuster and maintains zero lash in the valve train. This eliminates the need for periodic valve adjustment.

Engine Mechanical – 4.3L - Specifications

Application	Specification	
	Metric	English
General Data		
• Engine Type	V6	
• RPO Code	L35	
• VIN Code	W	
• Displacement	4.3 L	262 CID
• Bore	101.60 mm	4.012 in
• Stroke	88.39 mm	3.480 in
• Compression Ratio	9.2:1	
• Firing Order	1-6-5-4-3-2	
• Spark Plug Gap	1.52 mm	0.060 in
• Oil Pressure - Minimum - at Normal Operating Temperature	42 kPa at 1,000 RPM 125 kPa at 2,000 RPM 166 kPa at 4,000 RPM	6 psig at 1,000 RPM 18 psig at 2,000 RPM 24 psig at 4,000 RPM
Balance Shaft		
• Rear Bearing Journal Clearance	0.050-0.088 mm	0.0020-0.0035 in
• Rear Bearing Journal Diameter	38.085-38.100 mm	1.4994-1.500 in
Camshaft		
• End Play	0.0254-0.2286 mm	0.0010-0.0090 in
• Journal Diameter	47.440-47.490 mm	1.8677-1.8696 in
• Journal Diameter Out-of-Round	0.025 mm - Maximum	0.0010 in - Maximum
• Lobe Lift - Exhaust	7.20-7.30 mm	0.283-0.287 in
• Lobe Lift - Intake	6.97-7.07 mm	0.274-0.278 in
• Runout	0.065 mm	0.0026 in

Connecting Rod		
• Connecting Rod Bearing Clearance - Production	0.038-0.078 mm	0.0015-0.0031 in
• Connecting Rod Bearing Clearance - Service	0.025-0.063 mm	0.0010-0.0025 in
• Connecting Rod Journal Diameter	57.116-57.148 mm	2.2487-2.2497 in
• Connecting Rod Journal Out-of-Round - Production	0.007 mm - Maximum	0.0002 in - Maximum
• Connecting Rod Journal Out-of-Round - Service	0.025 mm - Maximum	0.0010 in - Maximum
• Connecting Rod Journal Taper - Production	0.00508 mm - Maximum	0.00030 in - Maximum
• Connecting Rod Journal Taper - Service	0.025 mm - Maximum	0.0010 in - Maximum
• Connecting Rod Side Clearance	0.15-0.44 mm	0.006-0.017 in
Crankshaft		
• Crankshaft Bearing Clearance - Journal #1- Production	0.02-0.508 mm	0.0008-0.0020 in
• Crankshaft Bearing Clearance - Journal #2, #3, and #4-Production	0.028-0.058 mm	0.0011-0.0023 in
• Crankshaft Bearing Clearance - Journal #1- Service	0.0254-0.05 mm	0.0010-0.0020 in
• Crankshaft Bearing Clearance - Journal #2, #3, and #4-Service	0.025-0.063 mm	0.0010-0.0250 in
• Crankshaft End Play	0.050-0.20 mm	0.002-0.008 in
• Crankshaft Journal Diameter - Journal #1	62.199-62.217 mm	2.4488-2.4495 in
• Crankshaft Journal Diameter - Journal #2 and #3	62.191-62.215 mm	2.4485-2.4494 in
• Crankshaft Journal Diameter - Journal #4	62.179-62.203 mm	2.4480-2.4489 in
• Crankshaft Journal Out-of-Round - Production	0.005 mm - Maximum	0.0002 in - Maximum
• Crankshaft Journal Out-of-Round - Service	0.025 mm - Maximum	0.0010 in - Maximum
• Crankshaft Journal Taper - Production	0.007 mm - Maximum	0.0003 in - Maximum
• Crankshaft Runout	0.025 mm - Maximum	0.0010 in - Maximum
Cylinder Bore		
• Diameter	101.618-101.643 mm	4.0007-4.0017 in
• Out-of-Round - Production	0.0127 mm - Maximum	0.00050 in - Maximum
• Out-of-Round - Service	0.05 mm - Maximum	0.002 in - Maximum
• Taper - Production Relief Side	0.025 mm - Maximum	0.0010 in - Maximum
• Taper - Production Thrust Side	0.012 mm - Maximum	0.0005 in - Maximum
• Taper - Service	0.025 mm - Maximum	0.0010 in - Maximum
Cylinder Head		
• Surface Flatness	0.10 mm - Maximum	0.004 in - Maximum
Exhaust Manifold		
• Surface Flatness - Flange to Flange	0.25 mm - Maximum	0.010 in - Maximum
• Surface Flatness - Individual Flange	0.05 mm - Maximum	0.002 in - Maximum
Intake Manifold		
• Surface Flatness	0.10 mm - Maximum	0.004 in - Maximum
Oil Pan		
• Oil Pan Alignment at Rear of Engine Block	0.3 mm - Maximum	0.011 in - Maximum

Piston		
• Piston Bore Clearance - Production	0.018-0.061 mm	0.0007-0.0024 in
• Piston Bore Clearance - Service	0.075 mm - Maximum	0.0029 in - Maximum
Piston Pin		
• Clearance in Piston - Production	0.013-0.023 mm	0.0005-0.0009 in
• Clearance in Piston - Service	0.025 mm - Maximum	0.0010 in - Maximum
• Diameter	23.545-23.548 mm	0.9270-0.9271 in
• Fit in Connecting Rod	0.012-0.048 mm - Interference	0.0005-0.0019 in - Interference
Piston Rings - End Gap Measured in Cylinder Bore		
• Piston Compression Ring Gap - Production-Top Groove	0.25-0.40 mm	0.010-0.016 in
• Piston Compression Ring Gap - Production-2nd Groove	0.38-0.58 mm	0.015-0.023 in
• Piston Compression Ring Gap - Service-Top Groove	0.25-0.50 mm	0.010-0.020 in
• Piston Compression Ring Gap - Service-2nd Groove	0.38-0.80 mm	0.015-0.031 in
• Piston Compression Ring Groove Clearance - Production-Top Groove	0.030-0.070 mm	0.0012-0.0027 in
• Piston Compression Ring Groove Clearance - Production-2nd Groove	0.040-0.080 mm	0.0015-0.0031 in
• Piston Compression Ring Groove Clearance - Service	0.030-0.085 mm	0.0012-0.0033 in
• Piston Oil Ring Gap - Production	0.25-0.76 mm	0.010-0.029 in
• Piston Oil Ring Gap - Service	0.005-0.090 mm	0.0002-0.0035 in
• Piston Oil Ring Groove Clearance - Production	0.046-0.196 mm	0.0018-0.0077 in
• Piston Oil Ring Groove Clearance - Service	0.046-0.200 mm	0.0018-0.0079 in
Valve System		
• Valve Face Angle	45 degrees	
• Valve Head Edge Margin	0.79 mm - Minimum	0.031 in - Minimum
• Valve Lash	Net Lash--No Adjustment	
• Valve Lift - Exhaust	10.879 mm	0.4280 in
• Valve Lift - Intake	10.527 mm	0.4140 in
• Valve Lifter	Hydraulic Roller Type	
• Valve Rocker Arm	Roller Pivot Type	
• Valve Rocker Arm Ratio	1.5:1	
• Valve Seat Angle	46 degrees	
• Valve Seat Runout	0.05 mm - Maximum	0.002 in - Maximum
• Valve Seat Width - Exhaust	1.651-2.489 mm	0.065-0.098 in
• Valve Seat Width - Intake	1.016-1.651 mm	0.040-0.065 in
• Valve Spring Free Length	51.3 mm	2.02 in
• Valve Spring Installed Height - Exhaust	42.92-43.43 mm	1.670-1.700 in
• Valve Spring Installed Height - Intake	42.92-43.43 mm	1.670-1.700 in
• Valve Spring Pressure - Closed	338-374 N at 43.2 mm	76-84 lb at 1.70 in
• Valve Spring Pressure - Open	832-903 N at 32.3 mm	187-203 lb at 1.27 in
• Valve Stem Clearance - Exhaust-Production	0.025-0.069 mm	0.0010-0.0027 in
• Valve Stem Clearance - Exhaust-Service	0.025-0.094 mm	0.0010-0.0037 in

• Valve Stem Clearance - Intake-Production	0.025-0.069 mm	0.0010-0.0027 in
• Valve Stem Clearance - Intake-Service	0.025-0.094 mm	0.0010-0.0037 in
• Valve Stem Oil Seal Installed Height - Measured from the Top of the Large Diameter Valve Guide Bevel to the Bottom of the Valve Stem Oil Seal	1-2 mm	0.03937-0.07874 in

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Control Cable Bracket Nut	12 N·m	106 lb in
Accelerator Control Cable Bracket Stud to Intake Manifold	6 N·m	53 lb in
Accelerator Control Cable Bracket Stud to Throttle Body	12 N·m	106 lb in
Air Cleaner Adapter Stud	8 N·m	71 lb in
Air Conditioning (A/C) Compressor Side Brace Bolt	25 N·m	18 lb ft
Air Conditioning (A/C) Hose Bracket Nut to Intake Manifold	5 N·m	44 lb in
Air Conditioning (A/C) Pipe Bracket Nut to Rear of Left Cylinder Head	35 N·m	26 lb ft
Balance Shaft Driven Gear Bolt		
• First Pass	20 N·m	15 lb ft
• Final Pass	35 degrees	
Balance Shaft Retainer Bolt	12 N·m	106 lb in
Belt Idler Pulley Bolt	50 N·m	37 lb ft
Body Bolt		
• First Pass in Sequence (All Bolts)	35 N·m	26 lb ft
• Final Pass in Sequence (Center Bolts)	155 N·m	114 lb ft
• Final Pass in Sequence (Front and Rear Bolts)	90 N·m	66 lb ft
Camshaft Retainer Bolt	12 N·m	106 lb in
Camshaft Sprocket Bolt	25 N·m	18 lb ft
Connecting Rod Nut		
• First Pass	27 N·m	20 lb ft
• Final Pass	70 degrees	
Crankshaft Balancer Bolt	95 N·m	70 lb ft
Crankshaft Bearing Cap Bolt (Preferred Method)		
• First Pass	20 N·m	15 lb ft
• Final Pass	73 degrees	
Crankshaft Bearing Cap Bolt (Optional Strategy)	105 N·m	77 lb ft
Crankshaft Position Sensor Bolt	9 N·m	80 lb in
Crankshaft Pulley Bolt	58 N·m	43 lb ft
Crankshaft Rear Oil Seal Housing Bolt and Nut	12 N·m	106 lb in
Crankshaft Rear Oil Seal Housing Retainer Stud	6 N·m	53 lb in
Cylinder Head Bolt (Preferred Method)		
• All Bolts First Pass in Sequence	30 N·m	22 lb ft
• Long Bolts Final Pass in Sequence	75 degrees	
• Medium Bolts Final Pass in Sequence	65 degrees	
• Short Bolts Final Pass in Sequence	55 degrees	
Cylinder Head Bolt (Optional On-Vehicle Strategy)		
• First Pass in Sequence	35 N·m	26 lb ft
• Second Pass in Sequence	60 N·m	44 lb ft
• Final Pass in Sequence	90 N·m	66 lb ft
Cylinder Head Core Hole Plug	20 N·m	15 lb ft
Distributor Cap Bolt	2.4 N·m	21 lb in
Distributor Clamp Bolt	25 N·m	18 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft

EGR Valve Bolt		
• First Pass	7 N·m	62 lb in
• Final Pass	30 N·m	22 lb ft
EGR Valve Inlet Pipe Clamp Bolt	25 N·m	18 lb ft
EGR Valve Inlet Pipe Nut at Exhaust Manifold	30 N·m	22 lb ft
EGR Valve Inlet Pipe Nut at Intake Manifold	25 N·m	18 lb ft
Engine Block Coolant Drain Hole Plug	20 N·m	15 lb ft
Engine Block Left Rear Oil Gallery Plug	30 N·m	22 lb ft
Engine Block Left Side Oil Gallery Plug	20 N·m	15 lb ft
Engine Block Oil Gallery Plug	20 N·m	15 lb ft
Engine Block Right Rear Oil Gallery Plug	20 N·m	15 lb ft
Engine Coolant Heater Bolt/Screw	2 N·m	18 lb in
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Engine Flywheel Bolt	100 N·m	74 lb ft
Engine Front Cover Bolt	12 N·m	106 lb in
Engine Lift Bracket Bolt (Special Tool J 41427)	15 N·m	11 lb ft
Engine Lift Front Bracket Stud	35 N·m	26 lb ft
Engine Mount Bolt to Frame (4WD)	59 N·m	44 lb ft
Engine Mount Bolt to Frame (RWD)	47 N·m	35 lb ft
Engine Mount Bracket Bolt to Engine	64 N·m	47 lb ft
Engine Mount Bracket to Frame Bolt (RWD)	47 N·m	35 lb ft
Engine Mount Bracket to Frame Nut (RWD)	42 N·m	31 lb ft
Engine Mount Frame Bracket Through-bolt	68 N·m	50 lb ft
Engine Mount Nut to Frame (RWD)	42 N·m	31 lb ft
Engine Oil Pressure Gauge Sensor	30 N·m	22 lb ft
Engine Oil Pressure Gauge Sensor Fitting (Plus Required Angle)	15 N·m	11 lb ft
Engine Wiring Harness Bracket Bolt to Generator and Drive Belt Tensioner Bracket	25 N·m	18 lb ft
Engine Wiring Harness Bracket Nut to Evaporative Emission (EVAP) Canister Purge Solenoid Valve	8 N·m	71 lb in
Engine Wiring Harness Bracket Nut to Intake Manifold	12 N·m	106 lb in
Engine Wiring Harness Retainer Bolt to Rear of Right Cylinder Head	36 N·m	27 lb ft
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Nut to Intake Manifold	10 N·m	89 lb in
Exhaust Manifold Bolt/Stud		
• First Pass	15 N·m	11 lb ft
• Final Pass	30 N·m	22 lb ft
Fan and Water Pump Pulley Bolt	25 N·m	18 lb ft
Fuel Meter Body Bracket Bolt	10 N·m	89 lb in
Fuel Pipe Bracket Bolt	6 N·m	53 lb in
Fuel Pipe Bracket Stud to Rear of Cylinder Head	33 N·m	24 lb ft
Fuel Pipe Retainer Nut	3 N·m	27 lb in
Fuel Supply Pipe Nut (Fuel Tank Side)	30 N·m	22 lb ft
Generator and Drive Belt Tensioner Bracket Bolt to Engine	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud Nut	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud to Engine	20 N·m	15 lb ft
Ground Wire Bolt to Rear of Cylinder Head	35 N·m	26 lb ft
Ground Wire Nut to Water Outlet Stud	19 N·m	14 lb ft
Ignition Coil Stud	12 N·m	106 lb in
Knock Sensor	20 N·m	15 lb ft
Lower Intake Manifold Bolt		
• First Pass in Sequence	3 N·m	27 lb in

• Second Pass in Sequence	12 N·m	106 lb in
• Final Pass in Sequence	15 N·m	11 lb ft
Negative Battery Cable Stud	40 N·m	30 lb ft
Oil Cooler Pipe Bracket Bolt to Oil Pan	10 N·m	89 lb in
Oil Fill Tube Bolt	25 N·m	18 lb ft
Oil Filter Adapter Bolt	21 N·m	15 lb ft
Oil Filter Fitting	55 N·m	41 lb ft
Oil Level Indicator Tube Bolt	12 N·m	106 lb in
Oil Level Indicator Tube Bolt to Transmission Fluid Fill Tube	12 N·m	106 lb in
Oil Pan Baffle Bolt	12 N·m	106 lb in
Oil Pan Bolt and Nut	25 N·m	18 lb ft
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pump Bolt to Rear Crankshaft Bearing Cap	90 N·m	66 lb ft
Oil Pump Cover Bolt	12 N·m	106 lb in
Park Brake Bracket Bolt to Frame	24 N·m	18 lb ft
Power Steering Pump Bolt	50 N·m	37 lb ft
Power Steering Pump Bracket Bolt to Engine	41 N·m	30 lb ft
Power Steering Pump Bracket Stud Nut	41 N·m	30 lb ft
Power Steering Pump Bracket Stud to Engine	20 N·m	15 lb ft
Power Steering Pump Rear Bracket Nut to Engine	41 N·m	30 lb ft
Power Steering Pump Rear Bracket Nut to Power Steering Pump	50 N·m	37 lb ft
Spark Plug		
• Initial Installation (NEW Cylinder Head)	30 N·m	22 lb ft
• All Subsequent Installations	15 N·m	11 lb ft
Spark Plug Wire Support Bolt	12 N·m	106 lb in
Starter Motor Wiring Harness/Transmission Cooler Pipe Bracket Bolt to Oil Pan	10 N·m	89 lb in
Throttle Body Stud	9 N·m	80 lb in
Transmission Bolt to Oil Pan	47 N·m	35 lb ft
Transmission Cover Bolt	12 N·m	106 lb in
Transmission Fluid Fill Tube Bolt to Accelerator Control Cable Bracket	6 N·m	53 lb in
Upper Intake Manifold Stud		
• First Pass	5 N·m	44 lb in
• Final Pass	9 N·m	80 lb in
Upper Radiator Hose Support Bracket Nut to Exhaust Manifold Stud	36 N·m	27 lb ft
Valve Lifter Pushrod Guide Bolt	16 N·m	12 lb ft
Valve Rocker Arm Bolt	30 N·m	22 lb ft
Water Outlet Stud	25 N·m	18 lb ft
Water Pump Bolt	45 N·m	33 lb ft

Drive Belt System Description

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The drive belt idler pulley
- The crankshaft balancer pulley
- The accessory drive component mounting brackets
- The accessory drive components
 - The power steering pump, if belt driven
 - The generator
 - The A/C compressor, if equipped
 - The engine cooling fan, if belt driven

- The water pump, if belt driven
- The vacuum pump, if equipped
- The air compressor, if equipped

The drive belt system may use one belt or two belts. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. There also may be a V-belt style belt used to drive certain accessory drive components. The drive belts are made of different types of rubbers (chloroprene or EPDM) and have different layers or plys containing either fiber cloth or cords for reinforcement.

Both sides of the drive belt may be used to drive the different accessory drive components. When the back side of the drive belt is used to drive a pulley, the pulley is smooth.

The drive belt is pulled by the crankshaft balancer pulley across the accessory drive component pulleys. The spring loaded drive belt tensioner keeps constant tension on the drive belt to prevent the drive belt from slipping. The drive belt tensioner arm will move when loads are applied to the drive belt by the accessory drive components and the crankshaft.

The drive belt system may have an idler pulley, which is used to add wrap to the adjacent pulleys. Some systems use an idler pulley in place of an accessory drive component when the vehicle is not equipped with the accessory.

Engine Cooling

Engine Cooling System Approximate Capacities

Application	Specifications	
	Metric	English
4.3L (VIN W) w/o C36 (Rear Heater)	13.5 L	14.3 qt
4.3L (VIN W) with C36 (Rear Heater)	15.5 L	16.5 qt

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Coolant Outlet Bolt/Stud	25 N·m	18 lb ft
Cooling Fan Clutch to Water Pump Bolts	56 N·m	41 lb ft
Cooling Fan Blade to Fan Clutch Bolts	33 N·m	24 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
Engine Oil Cooler Line Clip Bolt	10 N·m	89 lb in
Engine Oil Cooler Lines to Oil Filter Adapter Assembly Bolt	35 N·m	26 lb ft
Upper Fan Shroud Bolts	15 N·m	11 lb ft
Coolant Pump Pulley to Water Pump Bolts	25 N·m	18 lb ft
Coolant Pump to Engine Block Bolts	45 N·m	33 lb ft

Cooling System Description and Operation

Coolant Heater

The optional engine coolant heater (RPO K05) operates using 110-volt AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather -29°C (-20°F). The coolant heater helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. A weather shield on the cord is provided to protect the plug when not in use.

Cooling System

The cooling system's function is to maintain an efficient engine operating temperature during all engine speeds and operating conditions. The cooling system is designed to remove approximately one-third of the heat produced by the burning of the air-fuel mixture. When the engine is cold, the coolant does not flow to the radiator until the thermostat opens. This allows the engine to warm quickly.

Cooling Cycle

Coolant flows from the radiator outlet and into the water pump inlet. Some coolant flows from the water pump, to the heater core, then back to the water pump. This provides the passenger compartment with heat and defrost capability as the coolant warms up.

Coolant also flows from the water pump outlet and into the engine block. In the engine block, the coolant circulates through the water jackets surrounding the cylinders where it absorbs heat.

The coolant then flows through the cylinder head gasket openings and into the cylinder heads. In the cylinder heads, the coolant flows through the water jackets surrounding the combustion chambers and valve seats, where it absorbs additional heat.

From the cylinder heads, the coolant flows to the thermostat. The flow of coolant will either be stopped at the thermostat until the engine reaches normal operating temperature, or it will flow through the thermostat and into the radiator where it is cooled. At this point, the coolant flow cycle is completed.

Efficient operation of the cooling system requires proper functioning of all cooling system components. The cooling system consists of the following components:

Coolant

The engine coolant is a solution made up of a 50-50 mixture of DEX-COOL and suitable drinking water. The coolant solution carries excess heat away from the engine to the radiator, where the heat is dissipated to the atmosphere.

Radiator

The radiator is a heat exchanger. It consists of a core and two tanks. The aluminum core is a tube and fin crossflow design that extends from the inlet tank to the outlet tank. Fins are placed around the outside of the tubes to improve heat transfer to the atmosphere.

The inlet and outlet tanks are a molded, high temperature, nylon reinforced plastic material. A high temperature rubber gasket seals the tank flange edge to the aluminum core. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core.

The radiator also has a drain cock located in the bottom of the left hand tank. The drain cock unit includes the drain cock and drain cock seal.

The radiator removes heat from the coolant passing through it. The fins on the core transfer heat from the coolant passing through the tubes. As air passes between the fins, it absorbs heat and cools the coolant.

Pressure Cap

The pressure cap seals the cooling system. It contains a blow off or pressure valve and a vacuum or atmospheric valve. The pressure valve is held against its seat by a spring, which protects the radiator from excessive cooling system pressure. The vacuum valve is held against its seat by a spring, which permits opening of the valve to relieve vacuum created in the cooling system as it cools off. The vacuum, if not relieved, might cause the radiator and/or coolant hoses to collapse.

The pressure cap allows cooling system pressure to build up as the temperature increases. As the pressure builds, the boiling point of the coolant increases. Engine coolant can be safely run at a

temperature much higher than the boiling point of the coolant at atmospheric pressure. The hotter the coolant is, the faster the heat transfers from the radiator to the cooler, passing air.

The pressure in the cooling system can get too high. When the cooling system pressure exceeds the rating of the pressure cap, it raises the pressure valve, venting the excess pressure.

As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the surge tank. This equalizes the pressure in the cooling system with atmospheric pressure, preventing the radiator and coolant hoses from collapsing.

Coolant Recovery System

The coolant recovery system consists of a plastic coolant recovery reservoir and overflow tube. The recovery reservoir is also called a recovery tank or expansion tank. It is partially filled with coolant and is connected to the radiator fill neck with the overflow tube. Coolant can flow back and forth between the radiator and the reservoir.

In effect, a cooling system with a coolant recovery reservoir is a closed system. When the pressure in the cooling system gets too high, it will open the pressure valve in the pressure cap. This allows the coolant, which has expanded due to being heated, is allowed to flow through the overflow tube and into the recovery reservoir. As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum opens the vacuum valve in the pressure cap, allowing some of the coolant in the reservoir to be siphoned back into the radiator. Under normal operating conditions, no coolant is lost. Although the coolant level in the recovery reservoir goes up and down, the radiator and cooling system are kept full. An advantage to using a coolant recovery reservoir is that it eliminates almost all air bubbles from the cooling system. Coolant without bubbles absorbs heat much better than coolant with bubbles.

Air Baffles and Seals

The cooling system uses deflectors, air baffles and air seals to increase cooling system capability. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle and through the radiator to increase engine cooling. Air baffles are also used to direct airflow through the radiator and increase cooling capability. Air seals prevent air from bypassing the radiator and A/C condenser, and prevent recirculation of hot air for better hot weather cooling and A/C condenser performance.

Water Pump

The water pump is a centrifugal vane impeller type pump. The pump consists of a housing with coolant inlet and outlet passages and an impeller. The impeller is mounted on the pump shaft and consists of a series of flat or curved blades or vanes on a flat plate. When the impeller rotates, the coolant between the vanes is thrown outward by centrifugal force.

The impeller shaft is supported by one or more sealed bearings. The sealed bearings never need to be lubricated. Grease cannot leak out, dirt and water cannot get in as long as the seal is not damaged or worn.

The purpose of the water pump is to circulate coolant throughout the cooling system. The water pump is driven by the crankshaft via the drive belt.

Thermostat

The thermostat is a coolant flow control component. Its purpose is to help regulate the operating temperature of the engine. It utilizes a temperature sensitive wax-pellet element. The element connects to a valve through a small piston. When the element is heated, it expands and exerts pressure against the small piston. This pressure forces the valve to open. As the element is cooled, it contracts. This contraction allows a spring to push the valve closed.

When the coolant temperature is below the rated thermostat opening temperature, the thermostat valve remains closed. This prevents circulation of the coolant to the radiator and allows the engine to warm up. After the coolant temperature reaches the rated thermostat opening temperature, the thermostat valve will open. The coolant is then allowed to circulate through the thermostat to the radiator where the engine heat is dissipated to the atmosphere. The thermostat also provides a restriction in the cooling system, after it has opened. This restriction creates a pressure difference which prevents cavitation at the water pump and forces coolant to circulate through the engine block.

Engine Oil Cooler

The engine oil cooler is a heat exchanger. It is located inside the left side end tank of the radiator. The engine oil temperature is controlled by the temperature of the engine coolant that surrounds the oil cooler in the radiator.

The engine oil pump, pumps the oil through the engine oil cooler line to the oil cooler. The oil then flows through the cooler where the engine coolant absorbs heat from the oil. The oil is then pumped through the oil cooler return line, to the oil filter, to the engine block oil system.

Transmission Oil Cooler

The transmission oil cooler is a heat exchanger. It is located inside the right side end tank of the radiator. The transmission fluid temperature is regulated by the temperature of the engine coolant in the radiator.

The transmission oil pump, pumps the fluid through the transmission oil cooler line to the transmission oil cooler. The fluid then flows through the cooler where the engine coolant absorbs heat from the fluid. The fluid is then pumped through the transmission oil cooler return line, to the transmission.

Engine Electrical

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Battery Negative Cable to Engine Stud	40 N·m	29 lb ft
Battery Negative Cable Terminal Bolt	15 N·m	11 lb ft
Battery Positive Cable Terminal Bolt	15 N·m	11 lb ft
Battery Positive Cable to Starter Motor Nut	9 N·m	68 lb in
Battery Positive Cable to Underhood Electrical Center Nut	9 N·m	68 lb in
Battery Retainer Hold Down Bolt	23 N·m	17 lb ft
Battery Tray Bolts	25 N·m	18 lb ft
Distributor Cap Screws	5 N·m	40 lb in
Distributor Hold Down Bolt	27 N·m	20 lb ft
Distributor Rotor Screws	2 N·m	20 lb in
Engine Harness to Battery Negative Cable Nut	25 N·m	18 lb ft
Generator Mounting Bolts	50 N·m	37 lb ft
Generator Output (BAT) Terminal Nut	18 N·m	13 lb ft
Generator Pulley Nut	100 N·m	74 lb ft
Ground Lead to Radiator Support Stud	45 N·m	33 lb ft
Ignition Coil Hold Down Stud	11 N·m	97 lb in
Spark Plugs (New Head)	30 N·m	22 lb ft
Spark Plugs (Used Head)	15 N·m	11 lb ft
Starter Enable Relay Cable Nut	2 N·m	15 lb in
Starter Motor Mounting Bolts	43 N·m	32 lb ft
Underhood Electrical Center Mounting Bolts	8 N·m	60 lb in

Battery Usage

Application	Specification
4.3L (VIN W)	
GM Part Number	1810
Cold Cranking Amperage (CCA)	600
Reserve Capacity	115 min.
Replacement Model Number	78-6YR

Battery Temperature vs Minimum Voltage

Estimated Temperature °F	Estimated Temperature °C	Minimum Voltage
70 or above	21 or above	9.6
50	10	9.4
32	0	9.1
15	-10	8.8
0	-18	8.5
Below 0	Below -18	8.0

Starter Motor Usage Load Test @ 10 Volts Specs. PG-260

Engine Type	Starter Type	Load Test @ 10 Volts AMPS Minimum	Load Test @ 10 Volts AMPS Maximum	Load Test @ 10 Volts RPM Minimum	Load Test @ 10 Volts RPM Maximum
Gasoline Engine	PG260	47 AMPS	70 AMPS	6,500 RPM	11,000 RPM

Generator Usage

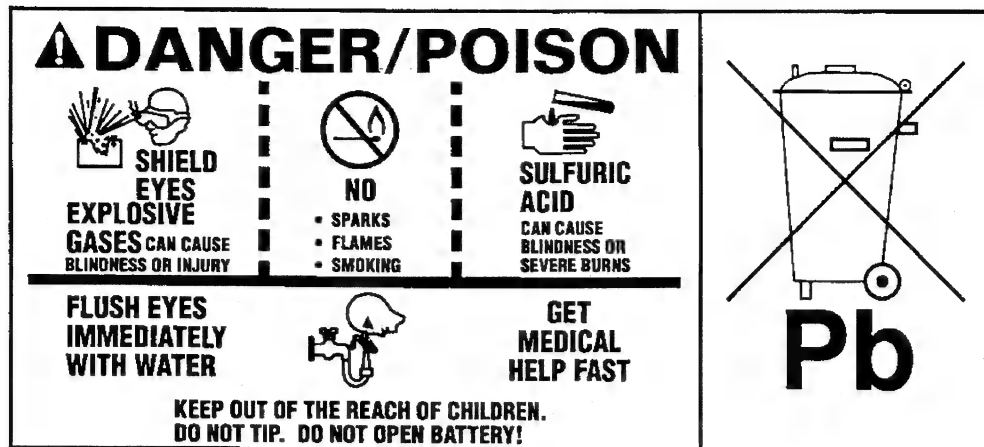
Engine	Generator Model	Option Code	Rated Output AMPS	Load Test Output AMPS
Gasoline Engine	CS130D	K60	100 A	70 A
Gasoline Engine	CS130D	K68	105 A	73 A

Battery Description and Operation

Caution

Batteries produce explosive gases, contain corrosive acid, and supply levels of electrical current high enough to cause burns. Therefore, to reduce the risk of personal injury when working near a battery:

- Always shield your eyes and avoid leaning over the battery whenever possible.
- Do not expose the battery to open flames or sparks.
- Do not allow the battery electrolyte to contact the eyes or the skin. Flush immediately and thoroughly any contacted areas with water and get medical help.
- Follow each step of the jump starting procedure in order.
- Treat both the booster and the discharged batteries carefully when using the jumper cables.



The maintenance free battery is standard. There are no vent plugs in the cover. The battery is completely sealed except for two small vent holes in the side. These vent holes allow the small amount of gas that is produced in the battery to escape.

The battery has three functions as a major source of energy:

- Engine cranking
- Voltage stabilizer
- Alternate source of energy with generator overload.

The battery specification label (example below) contains information about the following:

- The test ratings
- The original equipment catalog number
- The recommended replacement model number

CATALOG NO.

1819

CCA 770	LOAD TEST 380
REPLACEMENT MODEL 100-5YR	

A battery has 2 ratings:

- Reserve capacity
- Cold cranking amperage

When a battery is replaced use a battery with similar ratings. Refer to the battery specification label on the original battery or refer to Battery Usage .

Reserve Capacity

Reserve capacity is the amount of time in minutes it takes a fully charged battery, being discharged at a constant rate of 25 amperes and a constant temperature of 27°C (80°F) to reach a terminal voltage of 10.5 V. Refer to Battery Usage for the reserve capacity rating of the original equipment battery.

Cold Cranking Amperage

The cold cranking amperage is an indication of the ability of the battery to crank the engine at cold temperatures. The cold cranking amperage rating is the minimum amperage the battery must maintain for 30 seconds at -18°C (0°F) while maintaining at least 7.2 volts. Refer to Battery Usage for the cold cranking amperage rating for this vehicle.

Circuit Description

The battery positive terminal supplies Battery Positive voltage to the under hood fuse block and the rear fuse block. The under hood fuse block provides a cable connection for the generator and a cable connection for the starter.

The battery negative terminal is connected to chassis ground G305 and supplies ground for the AD converter in the DIM.

Starting System Description and Operation

Cranking Circuit

The cranking circuit consists of the battery, the starter motor, the ignition switch, and related electrical wiring. There is a fusible link in the wire running from the starter solenoid to the generator. For more information on the cranking circuit, refer to Cranking System Operation.

Starter Motor

The PG-260 starter motor achieves gear reduction at the rate of 5:1 through planetary gears. It's relatively small size and light weight offer improved cranking performance and reduced current requirements.

Solenoid windings are energized when the ignition switch is turned to the START position and the transmission is in the NEUTRAL or PARK. The plunger and shift lever movement causes the pinion to mesh with the engine flywheel ring gear, the solenoid main contacts to close, and the engine cranks. When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the key is released, at which time the plunger return spring causes the pinion to disengage. To prevent excessive overrunning, the key should be released immediately when the engine starts.

Charging System Description and Operation

Generator

The generator features the following major components:

- The delta stator
- The rectifier bridge
- The rotor with slip rings and brushes
- A conventional pulley
- Dual internal fans
- The regulator

The pulley and the fan cool the slip ring and the frame.

The generator features permanently lubricated bearings. Service should only include tightening of mount components. Otherwise, replace the generator as a complete unit.

Regulator

The voltage regulator controls the rotor field current in order to limit the system voltage. When the field current is on, the regulator switches the current on and off at a rate of 400 cycles per second in order to perform the following functions:

- Radio noise control
- Obtain the correct average current needed for proper system voltage control

At high speeds, the on-time may be 10 percent with the off-time at 90 percent. At low speeds, the on-time may be 90 percent and the off-time 10 percent.

Circuit Description

The generator provides voltage to operate the vehicle's electrical system and to charge its battery. A magnetic field is created when current flows through the rotor. This field rotates as the rotor is driven by the engine, creating an AC voltage in the stator windings. The AC voltage is converted to DC by the rectifier bridge and is supplied to the electrical system at the battery terminal.

When the engine is running, the generator turn-on signal is sent to the generator from the PCM, turning on the regulator. The generator's voltage regulator controls current to the rotor, thereby controlling the output voltage. The rotor current is proportional to the electrical pulse width supplied by the regulator. When the engine is started, the regulator senses generator rotation by detecting AC voltage at the stator through an internal wire. Once the engine is running, the regulator varies the field current by controlling the pulse width. This regulates the generator output voltage for proper battery charging and electrical system operation. The generator F terminal is connected internally to the voltage regulator and externally to the PCM. When the voltage regulator detects a charging system problem, it grounds this circuit to signal the PCM that a problem exists. The PCM monitors the generator field duty cycle signal circuit. The system voltage sense circuit receives battery positive voltage that is Hot At All Times through a fuse link that is connected to the starter motor. This voltage is used by the regulator as the reference for system voltage control.

Charging System Indicator

The IPC illuminates the charge indicator in the message center when the following occurs:

- The PCM detects that the generator output is less than 11 volts or greater than 16 volts. The IPC receives a class 2 message from the PCM requesting illumination.
- The IPC determines that the system voltage is less than 11 volts or greater than 16 volts. The IPC receives a class 2 message from the body control module (BCM) indicating the system voltage.
- The IPC performs the displays test at the start of each ignition cycle. The indicator illuminates for approximately 3 seconds.
- The ignition is on, with the engine off.

Engine Controls

Engine Controls – 4.3L

Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-6-5-4-3-2	
Spark Plug Wire Resistance	12,000 ohms per ft	
Spark Plug Torque	18 N·m	13 lb ft
Spark Plug Gap	1.52 mm	0.060 in
Spark Plug Type	41-9328 [AC plug type]	

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Cable Bracket Bolt	25 N·m	18 lb ft
Accelerator Cable Bracket Nut	30 N·m	22 lb ft
Air Cleaner Outlet Duct Nut	2.5 N·m	22 lb in
Crankshaft Position Sensor Mounting Bolt	20 N·m	15 lb ft
Coolant Hose Nipple	17 N·m	13 lb ft
EGR Valve Attaching Bolts	25 N·m	18 lb ft
EVAP Canister Retainer Attaching Bolt	10 N·m	88 lb in
Fuel Pipe Clip Bolt	6 N·m	53 lb in
Fuel Pipe Attaching Nuts	27 N·m	20 lb ft
Fuel Pipe to Fuel Rail Retaining Screw	3 N·m	27 lb in
Fuel Pipe Return Line Nut	3 N·m	27 lb in
Fuel Pressure Regulator Bracket	3.5 N·m	31 lb in
Fuel Rail Attaching Bolts	10 N·m	88 lb in
Fuel Tank Bracket Strap	45 N·m	33 lb ft
Idle Air Control Valve Attaching Screws	3 N·m	27 lb in
Pressure Regulator Screw	9.5 N·m	84 lb in
Power Brake Fitting	13 N·m	115 lb in
Purge Valve Mounting Bracket Attaching Bolt	8 N·m	71 lb in
Throttle Cable Bracket Bolts	25 N·m	18 lb ft
Throttle Body Retaining Studs	25 N·m	18 lb ft
TP Sensor Bolts	2 N·m	18 lb in
Upper Manifold Bolts	8 N·m	71 lb in
Upper Manifold Nuts	8 N·m	71 lb in
Vacuum Module Attaching Bolts	8 N·m	71 lb in

Fuel System Specifications

Use regular unleaded gasoline rated at 87 octane or higher. It is recommended that the gasoline meet specifications which have been developed by the American Automobile Manufacturers Association (AAMA) and endorsed by the Canadian Motor Vehicle Manufacturers Association for better vehicle performance and engine protection. Gasoline meeting the AAMA specification could provide improved driveability and emission control system performance compared to other gasolines. For more information, write to: American Automobile Manufacturer's Association, 7430 Second Ave, Suite 300, Detroit MI 48202.

Be sure the posted octane is at least 87. If the octane is less than 87, you may get a heavy knocking noise when you drive. If the knocking is bad enough, the knocking can damage your engine.

If you are using fuel rated at 87 octane or higher and you hear heavy knocking, your engine needs service. But do not worry if you hear a little pinging noise when you are accelerating or driving up a hill. That is normal, and you do not have to buy a higher octane fuel to get rid of the pinging. However, if there is a heavy, constant knock, that means you have a problem.

Notice

Your vehicle was not designed for fuel that contains methanol. Do not use methanol fuel which can corrode metal parts in your fuel system and also damage plastic and rubber parts. This kind of damage would not be covered under your warranty.

If your vehicle is certified to meet California Emission Standards, indicated on the under hood emission control label, your vehicle is designed to operate on fuels that meet California specifications. If such fuels are not available in states adopting California emissions standards, your vehicle will operate satisfactorily on fuels meeting federal specifications, but emission control system performance may be affected. The malfunction indicator lamp on your instrument panel may turn ON and/or your vehicle may fail a smog-check test. If this occurs, return to your authorized dealer for diagnosis to determine the cause of failure. In the event there is a determination that the cause of the condition is the type of fuels used, repairs may not be covered by your warranty.

Some gasolines that are not reformulated for low emissions may contain an octane-enhancing additive called methylcyclopentadienyl manganese tricarbonyl (MMT). Ask your service station operator whether or not the fuel contains MMT.

Exhaust System

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter-to-Muffler Nuts	40 N·m	30 lb ft
Exhaust Pipe-to-Manifold Nuts	53 N·m	39 lb ft
Exhaust Pipe-to-Manifold Studs	15 N·m	11 lb ft
Hanger-to-Frame Nuts	45 N·m	33 lb ft
Hanger-to-Transfer Case Bolts (A4WD)	55 N·m	40 lb ft
Hanger-to-Transmission Bolts (RWD)	45 N·m	33 lb ft
Muffler Hanger-to-Frame Bolts	25 N·m	18 lb ft

Exhaust System Description

Important

Use of non-OEM parts may cause driveability concerns.

The exhaust system design varies according to the model designation and the intended use of the vehicle.

In order to secure the exhaust pipe to the exhaust manifold, the exhaust system utilizes a flange and seal joint coupling. A flange and gasket coupling secures the catalytic converter assembly to the muffler assembly.

Hangers suspend the exhaust system from the underbody, allowing some movement of the exhaust system and disallowing the transfer of noise and vibration into the vehicle.

Heat shields protect the vehicle from the high temperatures generated by the exhaust system.

Resonator

Some exhaust systems are equipped with a resonator. The resonator, located either before or after the muffler, allows the use of mufflers with less back pressure. Resonators are used when vehicle characteristics require specific exhaust tuning.

Catalytic Converter

The catalytic converter is an emission control device added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) pollutants from the exhaust gas.

The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within a sheet metal shell. The substrate may be washcoated with 3 noble metals:

- Platinum (Pt)
- Palladium (Pd)
- Rhodium (Rh)

The catalyst in the converter is not serviceable.

Muffler

The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

Transmission/Transaxle Description and Operation

Automatic Transmission – 4L60E

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accumulator Cover to Case Bolt	8.0-14.0 N·m	6-10 lb ft
Case Extension to Case Bolt	42.0-48.0 N·m	31-35 lb ft
Case Extension to Case Bolt (4WD Shipping)	11.2-22.6 N·m	8.3-16.7 lb ft
Converter Cover Bolt	10 N·m	89 lb in
Converter Housing to Case Screw	65.0-75.0 N·m	48-55 lb ft
Cooler Pipe Connector	35.0-41.0 N·m	26-30 lb ft
Detent Spring to Valve Body Bolt	20.0-27.0 N·m	15-20 lb ft
Floorshift Control Bolt	10 N·m	89 lb in
Flywheel to Torque Converter Bolt	63 N·m	46 lb ft
Forward Accumulator Cover to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Heat Shield to Transmission Bolt	17 N·m	13 lb ft
Line Pressure Plug	8.0-14.0 N·m	6-10 lb ft
Manual Shaft to Inside Detent Lever Nut	27.0-34.0 N·m	20-25 lb ft
Negative Battery Cable Bolt	15 N·m	11 lb ft
Oil Level Indicator Bolt	47 N·m	35 lb ft
Oil Pan to Transmission Case Bolt	11 N·m	97 lb in
Oil Passage Cover to Case Bolt	8-14.0 N·m	6-10 lb ft
Park Brake Bracket to Case Bolt	27.0-34.0 N·m	20-25 lb ft
Park/Neutral Position Switch Screw	3 N·m	27 lb in
Plate to Case Bolt (Shipping)	27.0-34.0 N·m	20-25 lb ft
Plate to Converter Bolt (Shipping)	27.0-34.0 N·m	20-25 lb ft
Plug Assembly, Automatic Transmission Oil Pan (C/K)	30-40 N·m	22.1-29.5 lb ft
Plug Assembly, Automatic Transmission Oil Pan (Y)	28-32 N·m	20.7-23.6 lb ft
Pressure Control Solenoid Bracket to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Pump Assembly to Case Bolt	26.0-32.0 N·m	19-24 lb ft
Pump Cover to Pump Body Bolt	20.0-27.0 N·m	15-20 lb ft
Shift Cable Grommet Screw	1.7 N·m	15 lb in
Shift Control Cable Attachment	20 N·m	15 lb ft
Speed Sensor Retainer Bolt	10.5-13.5 N·m	7.7-10 lb ft
Stud, Automatic Transmission Case Extension (Y-car)	18.0-22.0 N·m	13-16 lb ft
TCC Solenoid Assembly to Case Bolt	8.0-14.0 N·m	6-10 lb ft
Trans Mount to Transmission Bolt	25 N·m	18 lb ft
Transmission Fluid Pressure Manual Valve Position Switch to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Transmission Oil Cooler Pipe Fitting	35.0-41.0 N·m	26-30 lb ft
Transmission Oil Pan to Case Bolt	9.5-13.8 N·m	7-10 lb ft
Transmission to Engine Bolt	47 N·m	35 lb ft
Valve Body to Case Bolt	8.0-14.0 N·m	6-10 lb ft

Transmission General Specifications

Name	Hydra-matic 4L60-E
RPO Codes	M30
Production Location	Toledo, Ohio Romulus, MI Ramos Arizpe, Mexico
Vehicle Platform (Engine/Transmission) Usage	C/K, C/K 800, F, G, M/L, S/T, Y
Transmission Drive	Longitudinally-Mounted Rear Wheel Drive
1st Gear Ratio	3.059:1
2nd Gear Ratio	1.625:1
3rd Gear Ratio	1.000:1
4th Gear Ratio	0.696:1
Reverse	2.294:1
Torque Converter Size (Diameter of Torque Converter Turbine)	245 mm 258 mm 298 mm 300 mm
Pressure Taps	Line Pressure
Transmission Fluid Type	DEXRON® III
Transmission Fluid Capacity (Approximate)	245 mm Converter Dry: 8.3 l (8.8 qt) 258 mm Converter Dry: 8.8 l (9.3 qt) 298 mm Converter Dry: 11.25 l (11.9 qt) 300 mm Converter Dry: 11.50 l (12.1 qt)
Transmission Type: 4	Four Forward Gears
Transmission Type: L	Longitudinal Mount
Transmission Type: 60	Product Series
Transmission Type: E	Electronic Controls
Position Quadrant	P, R, N, Overdrive, D, 2, 1 P, R, N, Overdrive, 3, 2, 1
Case Material	Die Cast Aluminum
Transmission Weight Dry (Approximate)	245 mm Converter 65.4 kg (144.30 lb) 258 mm Converter 79.9 kg (176.6 lb) 298 mm Converter 70.5 kg (155.70 lb) 300 mm Converter 86.17 kg (190.5 lb)
Transmission Weight Wet (Approximate)	245 mm Converter 72.4 kg (159.55 lb) 258 mm Converter 89.2 kg (197.7 lb) 298 mm Converter 80.5 kg (176.16 lb) 300 mm Converter 98.4 kg (218.0 lb)
Maximum Trailer Towing Capacity	6 130 kg (13,500 lb)
Maximum Gross Vehicle Weight (GVW)	3 900 kg (8,600 lb)

2000 Chevrolet Astro Van Restoration Kit

Fluid Capacity Specifications

Application	Specification	
	Metric	English
Bottom Pan Removal	4.7 liters	5 quarts
Complete Overhaul	10.6 liters	11 quarts
(measurements are approximate)		

Range Reference

Range	Park	Reverse	Neutral	OD				D			2		1	
Gear				1st	2nd	3rd	4th	1st	2nd	3rd	1st**	2nd	1st	2nd**
1-2 Shift Solenoid	ON*	ON*	ON*	ON	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	ON	OFF
2-3 Shift Solenoid	ON*	ON*	ON*	ON	ON	OFF	OFF	ON	ON	OFF	ON	ON	ON	ON
2-4 Band	--	--	--	--	A	--	A	--	A	--	--	A	--	A
Reverse Input Clutch	--	A	--	--	--	--	--	--	--	--	--	--	--	--
Overrun Clutch	--	--	--	--	--	--	--	--	--	A	A	A	A	A
Forward Clutch	--	--	--	A	A	A	A	A	A	A	A	A	A	A
Forward Sprag Clutch Assembly	--	--	--	H	H	H	--	H	H	H	H	H	H	H
3-4 Clutch	--	--	--	--	--	A	A	--	--	A	--	--	--	--
Lo/Roller Clutch	--	--	--	H	--	--	--	H	--	--	H	--	H	--
Lo/Rev Clutch	A	A	--	--	--	--	--	--	--	--	--	--	A	--

- A = Applied
- H = Holding
- ON = The solenoid is energized.
- OFF = The solenoid is de-energized.
- *Shift Solenoid state is a function of vehicle speed and may change if the vehicle speed increases sufficiently in Park, Reverse or Neutral. However, this does not affect the operation of the transmission.
- **Manual Second-First gear is electronically prevented under normal operating conditions.
- ***Manual First-Second gear is only available above approximately 48-56 km/h (30-35 mph).

Shift Speed

G-Van/4L60-E		1-2 Shift @ +/- 250 RPM Output Shaft Speed			2-3 Shift @ +/- 200 RPM Output Shaft Speed			3-4 Shift @ +/- 150 RPM Output Shaft Speed			3-1 @ +/- 100 RPM Output Shaft Speed	3-2 @ +/- 100 RPM Output Shaft Speed	3-1 Wide Open Throttle Shift	2-3 Wide Open Throttle Shift	MIN TCC Apply @ 12% Throttle (RPM)
		12	25	50	12	25	50	12	25	50					
Trans Cal	Axle	---			---			---			---	---	---	---	---
4.3L (L35)															
B	3.42/3.73	486	613	1121	867	1142	1882	1227	1544	2453	N/A	719	1396	5000	1586
C	3.73	492	603	1118	849	1140	1855	1207	1520	2414	N/A	715	1363	5000	1565

Transmission Component and System Description

The 4L60E transmission consists primarily of the following components:

- Torque converter assembly
- Servo assembly and 2-4 band assembly
- Reverse input clutch and housing
- Overrun clutch
- Forward clutch
- 3-4 clutch
- Forward sprag clutch assembly
- Lo and reverse roller clutch assembly
- Lo and reverse clutch assembly
- Two planetary gear sets: Input and Reaction
- Oil pump assembly
- Control valve body assembly

The electrical components of the 4L60-E are as follows:

- 1-2 and 2-3 shift solenoid valves
- 3-2 shift solenoid valve assembly
- Transmission pressure control (PC) solenoid
- Torque converter clutch (TCC) solenoid valve
- TCC pulse width modulation (PWM) solenoid valve
- Automatic transmission fluid pressure (TFP) manual valve position switch
- Automatic transmission fluid temperature (TFT) sensor
- Vehicle speed sensor assembly

Adapt Function

Transmission Adapt Function

The 4L60-E transmission uses a line pressure control system, which has the ability to continuously adapt the system's line pressure. This compensates for normal wear of the following parts:

- The clutch fiber plates
- The seals
- The springs

The PCM maintains the Upshift Adapt parameters for the transmission. The PCM monitors the AT ISS sensor and the AT OSS during commanded shifts in order to determine if a shift is occurring too fast or too slow. The PCM adjusts the signal from the transmission pressure control solenoid in order to maintain a set shift feel.

Transmission adapts must be reset whenever the transmission is overhauled or replaced.

Automatic Transmission Shift Lock Control Description

The automatic transmission shift lock control is a safety device that prevents an inadvertent shift out of PARK when the ignition is ON. The driver must press the brake pedal before moving the shift lever out of the PARK position. The system consists of the following components:

- The automatic transmission shift lock control solenoid.
- The automatic transmission shift lock control switch.
- The park/neutral position switch.

With the ignition in the ON position battery positive voltage is supplied to the park/neutral position switch. With the transmission in the PARK position the contacts in the park/neutral position switch are closed. This allows current to flow through the switch to the automatic transmission shift lock control switch. The circuit continues through the normally-closed switch to the automatic transmission shift lock control solenoid. The automatic transmission shift lock control solenoid is permanently grounded. This energizes the automatic transmission shift lock control solenoid, locking the shift linkage in the PARK position. When the driver presses the brake pedal the contacts in the automatic transmission shift lock control switch open, causing the automatic transmission shift lock control solenoid to release. This allows the shift lever to move from the PARK position.

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Abbreviations and Meanings

Abbreviation	Meaning
A	
A	Ampere(s)
ABS	Antilock Brake System
A/C	Air Conditioning
AC	Alternating Current
ACC	Accessory, Automatic Climate Control
ACL	Air Cleaner
ACR4	Air Conditioning Refrigerant, Recovery, Recycling, Recharging
AD	Automatic Disconnect
A/D	Analog to Digital
ADL	Automatic Door Lock
A/F	Air/Fuel Ratio
AH	Active Handling
AIR	Secondary Air Injection
ALC	Automatic Level Control, Automatic Lamp Control
AM/FM	Amplitude Modulation/Frequency Modulation
Ant	Antenna
AP	Accelerator Pedal
APCM	Accessory Power Control Module
API	American Petroleum Institute
APP	Accelerator Pedal Position
APT	Adjustable Part Throttle
ASM	Assembly, Accelerator and Servo Control Module
ASR	Acceleration Slip Regulation
A/T	Automatic Transmission/Transaxle
ATC	Automatic Transfer Case, Automatic Temperature Control
ATDC	After Top Dead Center
ATSLC	Automatic Transmission Shift Lock Control
Auto	Automatic
avg	Average
A4WD	Automatic Four-Wheel Drive
AWG	American Wire Gage
B	
B+	Battery Positive Voltage
BARO	Barometric Pressure
BATT	Battery
BBV	Brake Booster Vacuum
BCA	Bias Control Assembly
BCM	Body Control Module

BHP	Brake Horsepower
BLK	Black
BLU	Blue
BP	Back Pressure
BPCM	Battery Pack Control Module
BPMV	Brake Pressure Modulator Valve
BPP	Brake Pedal Position
BRN	Brown
BTDC	Before Top Dead Center
BTM	Battery Thermal Module
BTSI	Brake Transmission Shift Interlock
Btu	British Thermal Units
C	
°C	Degrees Celsius
CAC	Charge Air Cooler
CAFE	Corporate Average Fuel Economy
Cal	Calibration
Cam	Camshaft
CARB	California Air Resources Board
CC	Coast Clutch
cm ³	Cubic Centimeters
CCM	Convenience Charge Module, Chassis Control Module
CCOT	Cycling Clutch Orifice Tube
CCP	Climate Control Panel
CD	Compact Disc
CE	Commutator End
CEAB	Cold Engine Air Bleed
CEMF	Counter Electromotive Force
CEX	Cabin Exchanger
cfm	Cubic Feet per Minute
cg	Center of Gravity
CID	Cubic Inch Displacement
CKP	Crankshaft Position
CKT	Circuit
C/Ltr	Cigar Lighter
CL	Closed Loop
CLS	Coolant Level Switch
CMC	Compressor Motor Controller
CMP	Camshaft Position
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO ₂	Carbon Dioxide

Coax	Coaxial
COMM	Communication
Conn	Connector
CPA	Connector Position Assurance
CPP	Clutch Pedal Position
CPS	Central Power Supply
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CRTC	Cathode Ray Tube Controller
CS	Charging System
CSFI	Central Sequential Fuel Injection
CTP	Closed Throttle Position
cu ft	Cubic Foot/Feet
cu in	Cubic Inch/Inches
CV	Constant Velocity Joint
CVRSS	Continuously Variable Road Sensing Suspension
Cyl	Cylinder(s)
D	
DAB	Delayed Accessory Bus
dB	Decibels
dBA	Decibels on A-weighted Scale
DC	Direct Current, Duty Cycle
DCM	Door Control Module
DE	Drive End
DEC	Digital Electronic Controller
DERM	Diagnostic Energy Reserve Module
DI	Distributor Ignition
dia	Diameter
DIC	Driver Information Center
Diff	Differential
DIM	Dash Integration Module
DK	Dark
DLC	Data Link Connector
DMCM	Drive Motor Control Module
DMM	Digital Multimeter
DMSDS	Drive Motor Speed and Direction Sensor
DMU	Drive Motor Unit
DOHC	Dual Overhead Camshafts
DR, Drvr	Driver
DRL	Daytime Running Lamps
DTC	Diagnostic Trouble Code

E	
EBCM	Electronic Brake Control Module
EBTCM	Electronic Brake and Traction Control Module
EC	Electrical Center, Engine Control
ECC	Electronic Climate Control
ECI	Extended Compressor at Idle
ECL	Engine Coolant Level
ECM	Engine Control Module, Electronic Control Module
ECS	Emission Control System
ECT	Engine Coolant Temperature
EEPROM	Electrically Erasable Programmable Read Only Memory
EEVIR	Evaporator Equalized Values in Receiver
EFE	Early Fuel Evaporation
EGR	Exhaust Gas Recirculation
EGR TVV	Exhaust Gas Recirculation Thermal Vacuum Valve
EHPS	Electro-Hydraulic Power Steering
EI	Electronic Ignition
ELAP	Elapsed
ELC	Electronic Level Control
E/M	English/Metric
EMF	Electromotive Force
EMI	Electromagnetic Interference
Eng	Engine
EOP	Engine Oil Pressure
EOT	Engine Oil Temperature
EPA	Environmental Protection Agency
EPR	Exhaust Pressure Regulator
EPROM	Erasable Programmable Read Only Memory
ESB	Expansion Spring Brake
ESC	Electronic Suspension Control
ESD	Electrostatic Discharge
ESN	Electronic Serial Number
ETC	Electronic Throttle Control, Electronic Temperature Control, Electronic Timing Control
ETCC	Electronic Touch Climate Control
ETR	Electronically Tuned Receiver
ETS	Enhanced Traction System
EVAP	Evaporative Emission
EVO	Electronic Variable Orifice
Exh	Exhaust

F	
°F	Degrees Fahrenheit
FC	Fan Control
FDC	Fuel Data Center
FED	Federal All United States except California
FEDS	Fuel Enable Data Stream
FEX	Front Exchanger
FF	Flexible Fuel
FFH	Fuel-Fired Heater
FI	Fuel Injection
FMVSS	Federal U.S. Motor Vehicle Safety Standards
FP	Fuel Pump
ft	Foot/Feet
FT	Fuel Trim
F4WD	Full Time Four-Wheel Drive
4WAL	Four-Wheel Antilock
4WD	Four-Wheel Drive
FW	Flat Wire
FWD	Front Wheel Drive, Forward
G	
g	Grams, Gravitational Acceleration
GA	Gage, Gauge
gal	Gallon
gas	Gasoline
GCW	Gross Combination Weight
Gen	Generator
GL	Gear Lubricant
GM	General Motors
GM SPO	General Motors Service Parts Operations
gnd	Ground
gpm	Gallons per Minute
GRN	Green
GRY	Gray
GVWR	Gross Vehicle Weight Rating
H	
H	Hydrogen
H ₂ O	Water
Harn	Harness
HC	Hydrocarbons
H/CMPR	High Compression

HD	Heavy Duty
HDC	Heavy Duty Cooling
hex	Hexagon, Hexadecimal
Hg	Mercury
Hi Alt	High Altitude
HO2S	Heated Oxygen Sensor
hp	Horsepower
HPL	High Pressure Liquid
HPS	High Performance System
HPV	High Pressure Vapor
HPVS	Heat Pump Ventilation System
Htd	Heated
HTR	Heater
HUD	Head-up Display
HVAC	Heater-Ventilation-Air Conditioning
HVACM	Heater-Vent-Air Conditioning Module
HVIL	High Voltage Interlock Loop
HVM	Heater Vent Module
Hz	Hertz
I	
IAC	Idle Air Control
IAT	Intake Air Temperature
IC	Integrated Circuit, Ignition Control
ICCS	Integrated Chassis Control System
ICM	Ignition Control Module
ID	Identification, Inside Diameter
IDI	Integrated Direct Ignition
IGBT	Insulated Gate Bi-Polar Transistor
ign	Ignition
ILC	Idle Load Compensator
in	Inch/Inches
INJ	Injection
inst	Instantaneous, Instant
IP	Instrument Panel
IPC	Instrument Panel Cluster
IPM	Instrument Panel Module
I/PEC	Instrument Panel Electrical Center
ISC	Idle Speed Control
ISO	International Standards Organization
ISS	Input Speed Shaft, Input Shaft Speed

K	
KAM	Keep Alive Memory
KDD	Keyboard Display Driver
kg	Kilogram
kHz	Kilohertz
km	Kilometer
km/h	Kilometers per Hour
km/l	Kilometers per Liter
kPa	Kilopascals
KS	Knock Sensor
kV	Kilovolts
L	
L	Liter
L4	Four Cylinder Engine, In-Line
L6	Six-Cylinder Engine, In-Line
lb	Pound
lb ft	Pound Feet Torque
lb in	Pound Inch Torque
LCD	Liquid Crystal Display
LDCL	Left Door Closed Locking
LDCM	Left Door Control Module
LDM	Lamp Driver Module
LED	Light Emitting Diode
LEV	Low Emissions Vehicle
LF	Left Front
lm	Lumens
LR	Left Rear
LT	Left
LT	Light
LT	Long Term
LTPI	Low Tire Pressure Indicator
LTPWS	Low Tire Pressure Warning System
M	
MAF	Mass Air Flow
Man	Manual
MAP	Manifold Absolute Pressure
MAT	Manifold Absolute Temperature
max	Maximum
M/C	Mixture Control
MDP	Manifold Differential Pressure

MFI	Multiport Fuel Injection
mi	Miles
MIL	Malfunction Indicator Lamp
min	Minimum
MIN	Mobile Identification Number
mL	Milliliter
mm	Millimeter
mpg	Miles per Gallon
mph	Miles per Hour
ms	Millisecond
MST	Manifold Surface Temperature
MSVA	Magnetic Steering Variable Assist, Magnasteer®
M/T	Manual Transmission/Transaxle
MV	Megavolt
mV	Millivolt
N	
NAES	North American Export Sales
NC	Normally Closed
NEG	Negative
Neu	Neutral
NI	Neutral Idle
NiMH	Nickel Metal Hydride
NLGI	National Lubricating Grease Institute
N·m	Newton-meter Torque
NO	Normally Open
NOx	Oxides of Nitrogen
NPTC	National Pipe Thread Coarse
NPTF	National Pipe Thread Fine
NOVRAM	Non-Volatile Random Access Memory
O	
O ₂	Oxygen
O ₂ S	Oxygen Sensor
OBD	On-Board Diagnostics
OBD II	On-Board Diagnostics Second Generation
OC	Oxidation Converter Catalytic
OCS	Opportunity Charge Station
OD	Outside Diameter
ODM	Output Drive Module
ODO	Odometer
OE	Original Equipment
OEM	Original Equipment Manufacturer
OHC	Overhead Camshaft

ohms	Ohm
OL	Open Loop, Out of Limits
ORC	Oxidation Reduction Converter Catalytic
ORN	Orange
ORVR	On-Board Refueling Vapor Recovery
OSS	Output Shaft Speed
oz	Ounce(s)
P	
PAG	Polyalkylene Glycol
PAIR	Pulsed Secondary Air Injection
PASS, PSGR	Passenger
PASS-Key®	Personalized Automotive Security System
P/B	Power Brakes
PC	Pressure Control
PCB	Printed Circuit Board
PCM	Powertrain Control Module
PCS	Pressure Control Solenoid
PCV	Positive Crankcase Ventilation
PEB	Power Electronics Bay
PID	Parameter Identification
PIM	Power Inverter Module
PM	Permanent Magnet Generator
P/N	Part Number
PNK	Pink
PNP	Park/Neutral Position
PRNDL	Park, Reverse, Neutral, Drive, Low
POA	Pilot Operated Absolute Valve
POS	Positive, Position
POT	Potentiometer Variable Resistor
PPL	Purple
ppm	Parts per Million
PROM	Programmable Read Only Memory
P/S, PS	Power Steering
PSCM	Power Steering Control Module, Passenger Seat Control Module
PSD	Power Sliding Door
PSP	Power Steering Pressure
psi	Pounds per Square Inch
psia	Pounds per Square Inch Absolute
psig	Pounds per Square Inch Gauge
pt	Pint
PTC	Positive Temperature Coefficient
PWM	Pulse Width Modulated

Q	
QDM	Quad Driver Module
qt	Quart(s)
R	
R-12	Refrigerant-12
R-134a	Refrigerant-134a
RAM	Random Access Memory, Non-permanent memory device, memory contents are lost when power is removed.
RAP	Retained Accessory Power
RAV	Remote Activation Verification
RCDLR	Remote Control Door Lock Receiver
RDCM	Right Door Control Module
Ref	Reference
Rev	Reverse
REX	Rear Exchanger
RIM	Rear Integration Module
RF	Right Front, Radio Frequency
RFA	Remote Function Actuation
RFI	Radio Frequency Interference
RH	Right Hand
RKE	Remote Keyless Entry
Rly	Relay
ROM	Read Only Memory, Permanent memory device, memory contents are retained when power is removed.
RPM	Revolutions per Minute Engine Speed
RPO	Regular Production Option
RR	Right Rear
RSS	Road Sensing Suspension
RTD	Real Time Damping
RT	Right
RTV	Room Temperature Vulcanizing Sealer
RWAL	Rear Wheel Antilock
RWD	Rear Wheel Drive
S	
s	Second(s)
SAE	Society of Automotive Engineers
SC	Supercharger
SCB	Supercharger Bypass
SCM	Seat Control Module
SDM	Sensing and Diagnostic Module
SEO	Special Equipment Option
SFI	Sequential Multiport Fuel Injection

SI	System International Modern Version of Metric System
SIAB	Side Impact Air Bag
SIR	Supplemental Inflatable Restraint
SLA	Short/Long Arm Suspension
sol	Solenoid
SO2	Sulfur Dioxide
SP	Splice Pack
S/P	Series/Parallel
SPO	Service Parts Operations
SPS	Service Programming System, Speed Signal
sq ft, ft ²	Square Foot/Feet
sq in, in ²	Square Inch/Inches
SRC	Service Ride Control
SRI	Service Reminder Indicator
SRS	Supplemental Restraint System
SS	Shift Solenoid
ST	Scan Tool
STID	Station Identification Station ID
S4WD	Selectable Four-Wheel Drive
Sw	Switch
SWPS	Steering Wheel Position Sensor
syn	Synchronizer
T	
TAC	Throttle Actuator Control
Tach	Tachometer
TAP	Transmission Adaptive Pressure, Throttle Adaptive Pressure
TBI	Throttle Body Fuel Injection
TC	Turbocharger, Transmission Control
TCC	Torque Converter Clutch
TCS	Traction Control System
TDC	Top Dead Center
TEMP	Temperature
Term	Terminal
TFP	Transmission Fluid Pressure
TFT	Transmission Fluid Temperature
THM	Turbo Hydro-Matic
TIM	Tire Inflation Monitoring, Tire Inflation Module
TOC	Transmission Oil Cooler
TP	Throttle Position
TPA	Terminal Positive Assurance
TPM	Tire Pressure Monitoring, Tire Pressure Monitor
TR	Transmission Range

TRANS	Transmission/Transaxle
TT	Tell Tail Warning Lamp
TV	Throttle Valve
TVRS	Television and Radio Suppression
TVV	Thermal Vacuum Valve
TWC	Three Way Converter Catalytic
TWC+OC	Three Way + Oxidation Converter Catalytic
TXV	Thermal Expansion Valve
U	
UART	Universal Asynchronous Receiver Transmitter
U/H	Underhood
U/HEC	Underhood Electrical Center
U-joint	Universal Joint
UTD	Universal Theft Deterrent
UV	Ultraviolet
V	
V	Volt(s), Voltage
V6	Six-Cylinder Engine, V-Type
V8	Eight-Cylinder Engine, V-Type
Vac	Vacuum
VAC	Vehicle Access Code
VATS	Vehicle Anti-Theft System
VCIM	Vehicle Communication Interface Mode
VCM	Vehicle Control Module
V dif	Voltage Difference
VDOT	Variable Displacement Orifice Tube
VDV	Vacuum Delay Valve
vel	Velocity
VES	Variable Effort Steering
VF	Vacuum Fluorescent
VIO	Violet
VIN	Vehicle Identification Number
VLR	Voltage Loop Reserve
VMV	Vacuum Modulator Valve
VR	Voltage Regulator
V ref	Voltage Reference
VSES	Vehicle Stability Enhancement System
VSS	Vehicle Speed Sensor

W	
w/	With
W/B	Wheel Base
WHL	Wheel
WHT	White
w/o	Without
WOT	Wide Open Throttle
W/P	Water Pump
W/S	Windshield
WSS	Wheel Speed Sensor
WU-OC	Warm Up Oxidation Converter Catalytic
WU-TWC	Warm Up Three-Way Converter Catalytic
X	
X-valve	Expansion Valve
Y	
yd	Yard(s)
YEL	Yellow

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Conversion - English/Metric

English	Multiply/ Divide by	Metric
In order to calculate English measurement, divide by the number in the center column.		
In order to calculate metric measurement, multiply by the number in the center column.		
Length		
in	25.4	mm
ft	0.3048	m
yd	0.9144	
mi	1.609	km
Area		
sq in	645.2	sq mm
	6.45	sq cm
sq ft	0.0929	sq m
sq yd	0.8361	
Volume		
cu in	16,387.00	cu mm
	16.387	cu cm
	0.0164	L
qt	0.9464	
gal	3.7854	
cu yd	0.764	cu m
Mass		
lb	0.4536	kg
ton	907.18	
	0.907	tonne (t)
Force		
Kg F	9.807	newtons (N)
oz F	0.278	
lb F	4.448	
Acceleration		
ft/s²	0.3048	m/s²
ln/s²	0.0254	
Torque		
Lb in	0.11298	N·m
lb ft	1.3558	
Power		
hp	0.745	kW

Pressure (Stress)		
inches of H2O	0.2488	kPa
lb/sq in	6.895	
Energy (Work)		
Btu	1055	J (J= one Ws)
lb ft	1.3558	
kW hour	3,600,000.00	
Light		
Foot Candle	10.764	lm/m²
Velocity		
mph	1.6093	km/h
Temperature		
(°F - 32) 5/9	=	°C
°F	=	(9/5 °C + 32)
Fuel Performance		
235.215/mpg	=	100 km/L

Equivalents - Decimal and Metric

Fraction (in)	Decimal (in)	Metric (mm)
1/64	0.015625	0.39688
1/32	0.03125	0.79375
3/64	0.046875	1.19062
1/16	0.0625	1.5875
5/64	0.078125	1.98437
3/32	0.09375	2.38125
7/64	0.109375	2.77812
1/8	0.125	3.175
9/64	0.140625	3.57187
5/32	0.15625	3.96875
11/64	0.171875	4.36562
3/16	0.1875	4.7625
13/64	0.203125	5.15937
7/32	0.21875	5.55625
15/64	0.234375	5.95312
1/4	0.25	6.35
17/64	0.265625	6.74687
9/32	0.28125	7.14375
19/64	0.296875	7.54062
5/16	0.3125	7.9375
21/64	0.328125	8.33437
11/32	0.34375	8.73125
23/64	0.359375	9.12812
3/8	0.375	9.525
25/64	0.390625	9.92187
13/32	0.40625	10.31875
27/64	0.421875	10.71562
7/16	0.4375	11.1125
29/64	0.453125	11.50937
15/32	0.46875	11.90625
31/64	0.484375	12.30312
1/2	0.5	12.7
33/64	0.515625	13.09687
17/32	0.53125	13.49375
35/64	0.546875	13.89062
9/16	0.5625	14.2875
37/64	0.578125	14.68437
19/32	0.59375	15.08125
39/64	0.609375	15.47812

Fraction (in)	Decimal (in)	Metric (mm)
5/8	0.625	15.875
41/64	0.640625	16.27187
21/32	0.65625	16.66875
43/64	0.671875	17.06562
11/16	0.6875	17.4625
45/64	0.703125	17.85937
23/32	0.71875	18.25625
47/64	0.734375	18.65312
3/4	0.75	19.05
49/64	0.765625	19.44687
25/32	0.78125	19.84375
51/64	0.796875	20.24062
13/16	0.8125	20.6375
53/64	0.828125	21.03437
27/32	0.84375	21.43125
55/64	0.859375	21.82812
7/8	0.875	22.225
57/64	0.890625	22.62187
29/32	0.90625	23.01875
59/64	0.921875	23.41562
15/16	0.9375	23.8125
61/64	0.953125	24.20937
31/32	0.96875	24.60625
63/64	0.984375	25.00312
1	1.0	25.4

Fasteners

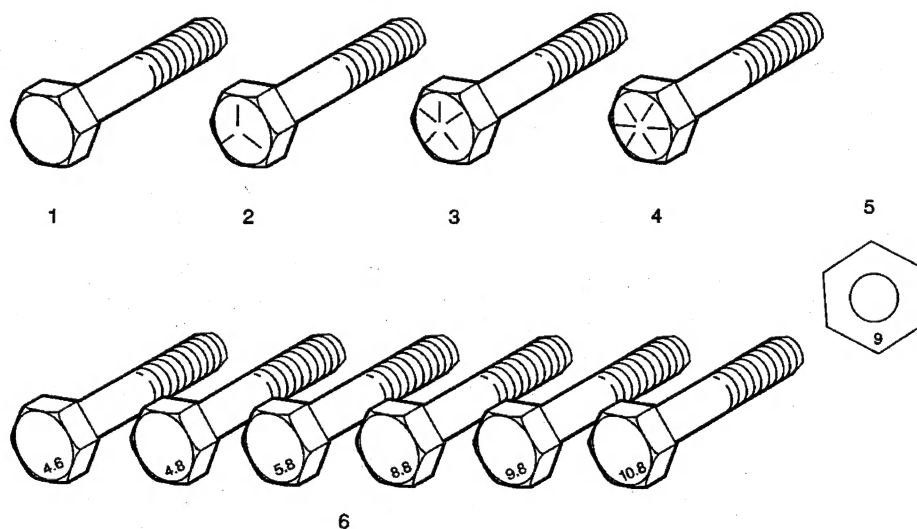
Metric Fasteners

This vehicle provides fastener dimensions using the metric system. Most metric fasteners are approximate in diameter to equivalent English fasteners. Make replacements using fasteners of the same nominal diameter, thread pitch, and strength.

A number marking identifies the OE metric fasteners except cross-recess head screws. The number also indicates the strength of the fastener material. A Posidrive® or Type 1A cross-recess identifies a metric cross-recess screw. For best results, use a Type 1A cross-recess screwdriver, or equivalent, in Posidrive® recess head screws.

GM Engineering Standards and North American Industries have adopted a portion of the ISO-defined standard metric fastener sizes. The purpose was to reduce the number of fastener sizes used while retaining the best thread qualities in each thread size. For example, the metric M6.0 X 1 screw, with nearly the same diameter and 25.4 threads per inch replaced the English 1/4-20 and 1/4-28 screws. The thread pitch is midway between the English coarse and fine thread pitches.

Fastener Strength Identification



1. English Bolt, Grade 2 (Strength Class)
2. English Bolt, Grade 5 (Strength Class)
3. English Bolt, Grade 7 (Strength Class)
4. English Bolt, Grade 8 (Strength Class)
5. Metric Nut, Strength Class 9
6. Metric Bolts, Strength Class Increases as Numbers Increase

The most commonly used metric fastener strength property classes are 9.8 and 10.9. The class identification is embossed on the head of each bolt. The English, inch strength classes range from grade 2 to grade 8. Radial lines are embossed on the head of each bolt in order to identify the strength class. The number of lines on the head of the bolt is 2 lines less than the actual grade. For example, a grade 8 bolt will have 6 radial lines on the bolt head. Some metric nuts are marked with a single digit strength identification number on the nut face.

The correct fasteners are available through GM SPO. Many metric fasteners available in the aftermarket parts channels are designed to metric standards of countries other than the United States, and may exhibit the following:

- Lower strength
- No numbered head marking system
- Wrong thread pitch

The metric fasteners on GM products are designed to new, international standards. The following are the common sizes and pitches, except for special applications:

- M6.0 X 1
- M8 X 1.25
- M10 X 1.5
- M12 X 1.75
- M14 X 2.00
- M16 X 2.00

Prevailing Torque Fasteners

Prevailing torque fasteners create a thread interface between the fastener and the fastener counterpart in order to prevent the fastener from loosening.

All Metal Prevailing Torque Fasteners

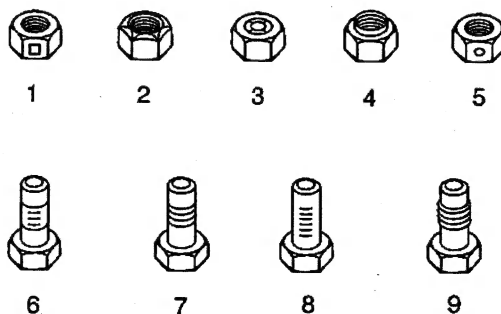
These fasteners accomplish the thread interface by a designed distortion or deformation in the fastener.

Nylon Interface Prevailing Torque Fasteners

These fasteners accomplish the thread interface by the presence of a nylon material on the fastener threads.

Adhesive Coated Fasteners

These fasteners accomplish the thread interface by the presence of a thread-locking compound on the fastener threads. Refer to the appropriate repair procedure in order to determine if the fastener may be reused and the applicable thread-locking compound to apply to the fastener.



1. Prevailing Torque Nut, Center Lock Type

2. Prevailing Torque Nut, Top Lock Type
3. Prevailing Torque Nut, Nylon Patch Type
4. Prevailing Torque Nut, Nylon Washer Insert Type
5. Prevailing Torque Nut, Nylon Insert Type
6. Prevailing Torque Bolt, Dry Adhesive Coating Type
7. Prevailing Torque Bolt, Thread Profile Deformed Type
8. Prevailing Torque Bolt, Nylon Strip Type
9. Prevailing Torque Bolt, Out-of-Round Thread Area Type

A prevailing torque fastener may be reused **ONLY** if:

- The fastener and the fastener counterpart are clean and not damaged
- There is no rust on the fastener
- The fastener develops the specified minimum torque against its counterpart prior to the fastener seating

Metric Prevailing Torque Fastener Minimum Torque Development

Application	Specification	
	Metric	English
All Metal Prevailing Torque Fasteners		
6 mm	0.4 N·m	4 lb in
8 mm	0.8 N·m	7 lb in
10 mm	1.4 N·m	12 lb in
12 mm	2.1 N·m	19 lb in
14 mm	3 N·m	27 lb in
16 mm	4.2 N·m	37 lb in
20 mm	7 N·m	62 lb in
24 mm	10.5 N·m	93 lb in
Nylon Interface Prevailing Torque Fasteners		
6 mm	0.3 N·m	3 lb in
8 mm	0.6 N·m	5 lb in
10 mm	1.1 N·m	10 lb in
12 mm	1.5 N·m	13 lb in
14 mm	2.3 N·m	20 lb in
16 mm	3.4 N·m	30 lb in
20 mm	5.5 N·m	49 lb in
24 mm	8.5 N·m	75 lb in

English Prevailing Torque Fastener Minimum Torque Development

Application	Specification	
	Metric	English
All Metal Prevailing Torque Fasteners		
1/4 in	0.5 N·m	4.5 lb in
5/16 in	0.8 N·m	7.5 lb in
3/8 in	1.3 N·m	11.5 lb in
7/16 in	1.8 N·m	16 lb in
1/2 in	2.3 N·m	20 lb in
9/16 in	3.2 N·m	28 lb in
5/8 in	4 N·m	36 lb in
3/4 in	7 N·m	54 lb in
Nylon Interface Prevailing Torque Fasteners		
1/4 in	0.3 N·m	3 lb in
5/16 in	0.6 N·m	5 lb in
3/8 in	1 N·m	9 lb in
7/16 in	1.3 N·m	12 lb in
1/2 in	1.8 N·m	16 lb in
9/16 in	2.5 N·m	22 lb in
5/8 in	3.4 N·m	30 lb in
3/4 in	5 N·m	45 lb in